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The Beard Faceplate.

It is a well-known fact among mechanics that work turned in a lathe, using the common one-tailed dog or clamp, is not likely to be truly cylindrical, because with the one driving point there is a lateral strain on the centers, first in one direction and then in the other, changing with each revolution of the lathe. With the one-tailed dog the leverage which the dog has in driving the work may also change with each revolution. These causes combine to produce work that is not truly round. Work driven from one point is also apt to "chatter," especially when a heavy cut is being taken.

The object of the faceplate, shown herewith, is by its peculiar construction, and by the use of double-tailed clamp to avoid the practical disadvantages incident to the use of the ordinary dog, producing work that is round and free from chatter marks.

Fig. 1 shows the faceplate and clamp upon a lathe ready for use. The clamp is precisely the same as the ordinary clamp in common use, except that it has two tails instead of one. When clamped upon the work, these tails are, of course, diametrically opposite each other.

Fig. 2 is a view of the faceplate with the front or covering disk removed, showing the levers, connecting piece or yoke, springs, etc. The upper half of Fig. 3 is a half section taken on a horizontal line through the center of Fig. 2. The lower half is a half section on a line through the center of the pins upon which the levers vibrate. Fig. 3 shows the shell and covering disk only, the levers, springs, etc., being removed.

The faceplate screws to the spindle, as usual, the lathe center projecting through the hole in the center of the plate. There are two radial recesses in the outer edge of the plate, diametrically opposite to each other. Into one side of each of these recesses projects a lever, which swings upon a pin located near the bottom of the recess. The inner ends of these levers are connected by a yoke or connecting piece having an elliptical opening in the center through which the lathe center passes.

To the outer end of each lever is attached the end of a spiral spring. These springs merely keep the levers and yoke in place, their length being such that the slight movement of the levers will not materially alter their tension.

The device operates as follows: When the lathe is started up, and one tail of the clamp comes in contact with one of the levers, that lever recedes as the faceplate revolves, and its motion is transmitted through the yoke to the other lever, which advances into the recess until it touches the second tail. The work is then driven from two points diametrically opposite each other, and with the same amount of pressure on each point. Driven in this manner there are no lateral strains whatever on the centers.

The faceplate and clamp are perfectly balanced, and the work may be revolved at a high rate of speed for filing or polishing without shaking the lathe. From the way in which it is driven this clamp will carry a much heavier cut than the ordinary dog, without slipping. This faceplate is the invention of Mr. Frederick C. Beard, of Aurora, Ill.

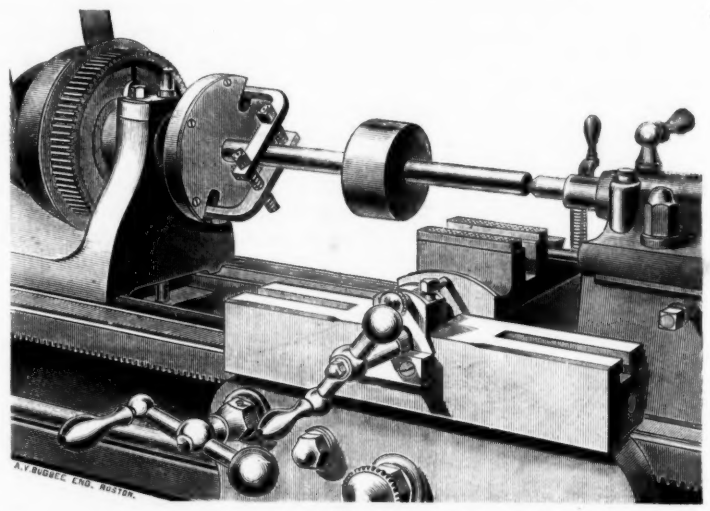


FIG. 1.

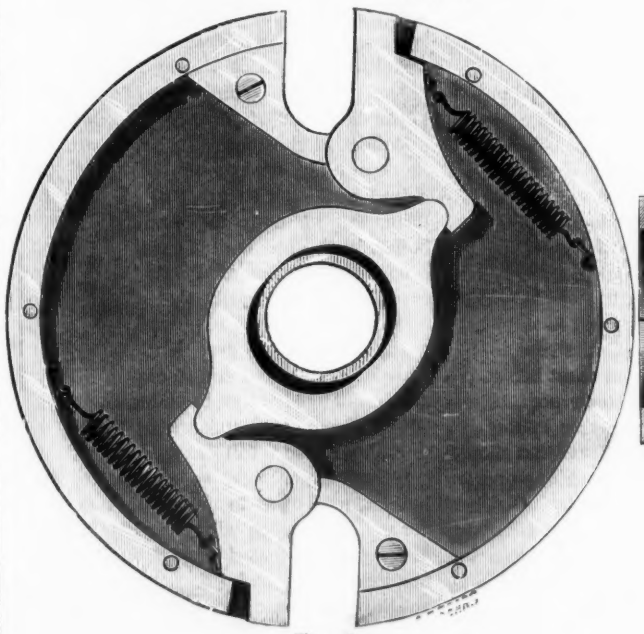


FIG. 2.

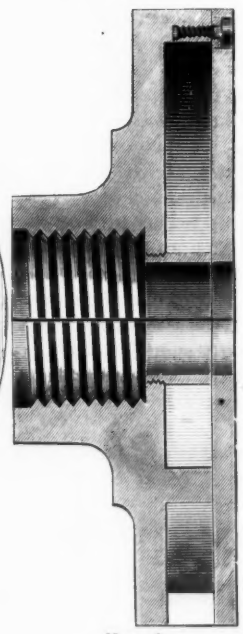


FIG. 3.

THE BEARD FACEPLATE.

Pattern Making—Its Nature and Conditions.

BY ISAAC WHITEHEAD.

The nature of pattern work, through its constant changing forms, and the necessity of its close co-operation with the foundry, require it to be mostly done in workshops with but two or three men, each one of them being required to be able to make any description of work that may be wanted. Where one man is required to command such a wide range of art, then knowledge becomes a greater factor in his ability to produce, just as truly as on the other hand, when a division of labor, as in the case of our large factories, allotting to each person the work of one simple operation, calls for little mechanical skill or judgment. To be a competent pattern maker, requires a knowledge of practical plane and solid geometry, and also mechanical drawing, as much and perhaps more than the draftsman, seeing he is required to lay upon an uneven angular surface, lines which are much easier got upon paper. He must have a knowledge of the nature of the wood, or other material used, and be able to construct, and form with accuracy any conceivable shape of body, so that it will best stand the strains of the work required, and keep its size. He must thoroughly understand how it can best be moulded, as he is required to decide how much of a pattern is necessary, where to make the parting, taper, prints, core boxes, take off the air and make loose pieces accordingly.

The object of pattern work is to help the moulder to make the mould that is necessary for the required casting; therefore he must know the capacity of the moulder and his appliances. Some moulds can be made cheaper without pattern by the use of strikes, others with a combination of strikes and parts of pattern, others with cores, while others require a full pattern of the size and shape of casting required, except the allowance for shrinkage. Thus a pattern may be made to cost more in the pattern making, and less in the moulding, or more in the moulding and less in the pattern making, according to which workman can do the work the cheapest. When our friends are going round to get figures on pattern work, they must know and specify how much of a pattern they require, or the figures will be no guide as to the cheapest bidder. The probable number of castings required also makes a difference in the construction and finish required of a pattern. For instance, if twenty castings are required from one pattern, and one hour's work more on the pattern would save the moulder five minutes on each mould, there would be an economy of forty minutes saved by the extra hour spent in pattern work; while if there was but one casting to be made, and the one hour's pattern work was still put upon it, there would be a loss of fifty-five minutes, seeing that the moulder was saved but five minutes' work. After the pattern maker has considered all the requirements of the moulder, he must follow the casting in his mind into the machine shop and consider the shrinkage, finish, and the parts that require to be most sound. Surely when we consider the wide range of thought, skill and experience necessary to the most efficient pattern making, it is no wonder we hear so often, when there is any mistake in any department, proverbially the first to be held responsible is the pattern maker.

The factor of intelligence is a much greater force in the production of patterns, than is generally recognized by our employers. Let us take the example of two workmen, A and B, just such as we all meet within our shops. A has studied the principles of drawing and the requirements of moulding, while B has confined himself to his bench and tools, and both are anxious to do their best. A commences first by going all over his drawing, taking in all the proportions of the work, and will arrange its construction in every particular, weighing carefully the conditions required in the case. He is apparently in no hurry, for before he has "commenced" his pattern, B has made considerable show in shavings, &c., and has got out something, which was as far as he saw at the time, and is apparently hurrying up and working hard. To unreflecting characters he looks more like business and is appreciated. A, having arranged all the parts of his work, can get out every part of it, if desirable, before putting it together so that the first two days of a week's work does not make a show equal to B, but when he comes to put it together it grows like magic, while B wonders how it is, as he watches the ease with which it is executed. It goads him on to make up in muscular labor what he has lost in want of foresight, and he has the discomfort of feeling that his pattern has become more a child of circumstances than of design. B is not the only one who suffers, but the foreman's extra time and anxiety to keep him straight, and the thinking for him, are often more than half the work. I remember one fine appearing man I had out of a shop of twenty-five men, who required more of my time than all the rest of the men put together to keep him straight. A good pattern maker is always learning, and must think for himself, because of the new demands that are constantly being made upon his ingenuity by new forms and devices.

There are few industries in which the exchange of notes, or experience, would be of greater benefit than in pattern making, because of the isolation of its workers, and the diversity of the work. For this reason, if any of my readers think they have any better devices, etc., than I advance in my

papers on pattern work, I shall call him my friend, if he exchange notes, so that we may choose the best, out of the many ways there are to accomplish the same end.

In conclusion, I wish to say a word to employers upon this question. I am strongly convinced that it would be to your financial profit to interest yourselves either in combination or individually, in the mechanical and scientific intelligence of your workmen, and of pattern makers in particular, just as truly as in the improvement of your machinery. Apprentices should be required, and inducements should be made to workmen, to improve themselves in the science and arts pertaining to their trade. The great advantage that would result from such efforts on your part cannot be estimated, because of the nature of saving in labor it would effect, rather than in the quantity of work that would result, like the fire engine, which produces nothing, but whose saving feature cannot be reckoned. Intelligence is a much more powerful factor to attain results, than muscle, in the mechanical artisan. Another feature of advantage you would gain would be a closer interest on the part of workmen with their employer, besides the better ability to compete and live more comfortably; just in the same relation of advantage which A possessed over B in my former illustration. This point is a very important one to the manufacturing interests of America at this moment, and should have immediate attention on your part, not necessarily as a philanthropic measure, but as one of economy. It is one of God's laws wherein the welfare of others is our own, and of which it has been truly said, "There is that scattereth, and yet increaseth; and there is that withholdeth more than is meet, but it tendeth to poverty."

The Indicator Diagram.

By F. F. Hemenway.

AN INSTRUCTIVE DIAGRAM.

The application of the indicator to the cylinder of a steam engine not infrequently reveals curious conditions, and affords instructive texts against dispensing with the use of that instrument. The diagram in Fig. 11 was taken from a cylinder 18½"x48", the engine running at thirty-five revolutions per minute; and the most interesting feature of the case is that it had been running ten years, all the time in condition to make just such a diagram. The cylinder had never been drilled for the indicator until the time when this diagram was taken, and then the indicator was applied to determine the horse-power used, the intention being to put in a new engine, not because this one did not work satisfactorily, but because it was believed to be overloaded, the estimate being that it was loaded to between one and two hundred horse-power. The engine had originally a plain slide valve, but had been changed to an automatic cut-off, the steam being cut off by a valve outside the steam chest, the time of closing of which was under control of the governor. This kind of valve motion is usually operated from the main valve rock arm or eccentric rod, the motion being the same, in direction, as that of the main valve, but the lap being nothing, or less than that of the main slide, provides for its opening in advance of the latter. In this instance, however, it was operated by a separate eccentric, which was undoubtedly unfortunate, as, if motion had been communicated by the main rock arm, it would hardly have been possible to have arranged it so badly.

The boiler pressure was 60½ pounds, out of which an initial pressure of 30 pounds was realized, with a steam line that struggled along up to 42 pounds at half-stroke, when the cut-off occurred. The point of cut-off is well defined, showing a sharp closure of the cut-off valve. This, with the compression line and admission, are the only tolerable features of the diagram. From the point of cut-off the pressure falls only 18 pounds by expansion, the volume of steam in the steam chest operating as clearance so far as expansion is concerned. What this clearance amounts to, illustrated by length added to the diagram, can be approximately determined. Thus, calling the volume of steam at the end of expansion (which is at the end of the stroke) 1, what must it have been at cut-off (half stroke)? As the pressure varies inversely with the volume, the determination of this is a simple matter of proportion. The pressure at cut-off, measuring from vacuum, is 57 pounds, and at the end of the stroke 39 pounds; then 57 : 39 : : 1 : .684, that is, instead of the volume at cut-off being one-half of the total volume, it is .684 of it. The length of the diagram is 4¼", nearly, so that the 2⅛" from cut-off to the end of the stroke is .316 of the total volume, which, instead of being represented by the length of the diagram, will be represented by a length of 2.125 ÷ .316 = 6.72 inches, or the clearance line must be drawn at a distance of 2.47 inches from the beginning of the diagram. This clearance has only to do with the expansion, as before the exhaust opens the communication between the cylinder and the steam chest is closed by the main valve.

The horse-power developed is 60, and the dry steam exhausted is 48½ pounds per horse-power per hour—at least twice what it ought to be. How much water was exhausted is not known, but there was so much in the cylinder that it was scarcely safe to keep the cylinder cocks closed while taking a diagram. Probably not less than 7 pounds of coal per horse-power per hour were used—say a ton a day more than should have been required. The engine had been running ten years in this condition, in which time it had wasted coal worth $15,000.

The cause of this is plainly shown by the diagram. Beginning with the compression line, the pressure comes up very satisfactorily

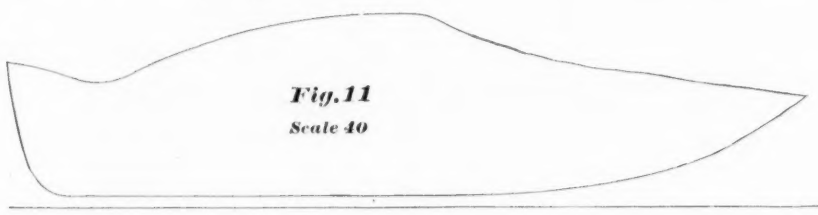


Fig. 11
Scale 40

to 30 pounds, when the main valve opens the steam port; but instead of the pressure rising to within a pound or two of boiler pressure, as the piston advances it falls to 26 pounds at about one-eighth of the stroke. The reason of this is that the cut-off valve is behind, and has not opened for the admission of steam to the steam chest, so that the only steam available for use in the cylinder for more than 6" of the stroke is that left in the steam chest at the end of expansion in the other end of the cylinder. At about one-eighth of the stroke, the cut-off valve, which should have opened early enough to have provided steam at full boiler pressure in the steam chest before the main valve uncovered the steam port, begins to open slowly, and the pressure in the cylinder crawls up, so that the cut-off that should have taken place at less than one-quarter stroke, takes place at one-half stroke. Then the volume of steam in the steam chest, together with that in the cylinder, is expanded to about 40 pounds, absolute, instead of to 20 pounds, or less, as it would have been under favorable conditions. The exhaust opens late and the counter-pressure falls slowly, the back pressure being 5 pounds, when, at that speed, it should not have been more than one-half pound—a clear loss of more than ten horse-power.

Altogether, it would be difficult to find worse conditions in an automatic engine, and it is safe to say that the application of the indicator ten years earlier would have pointed out a way to a very satisfactory saving. Such changes, for instance, as a steam chest with the least practicable amount of unoccupied room, to reduce the clearance during expansion; a main valve with more steam lap and more travel, so that the exhaust would have opened earlier and more rapidly, thus reducing the back pressure, and the cut-off eccentric advanced so as to open the cut-off valve in advance of the main valve, would have been suggested by the first diagram taken. It is believed that the cut-off valve was adjusted for the late opening to make it possible to obtain a later cut-off than otherwise, under the impression that the capacity of the engine would be increased by this means. If so, the attempt was a first-class failure, as materially more work could have been done by setting the cut-off eccentric so as to get steam of very near boiler pressure in the cylinder, and cutting off correspondingly early in the stroke.

Selecting a Boiler.

By George Marshall.

One of the most important questions presented to the mind of a steam user, requiring the purchase of a new boiler, is, "What kind shall I buy?" The probabilities are that, having read the circulars published and distributed by the owners of patent boilers, giving the results of tests made by them in competition with others, or made to show the evaporative qualities of their own invention, he has arrived at the conclusion "that a change is desirable in order to effect the greatest economy at the least possible outlay for fuel and attendance." In such a case, attention and study should be given to the surroundings, as in many cases room is an important factor, and the greatest power must be crowded in the least possible space.

Instances are known where a boiler has been ordered from a plan presented on paper, said plan having been made without any previous survey of the premises, and when the boiler was received the opening was too small to receive it, or the height of floor was insufficient to allow its erection. In cases of this kind unusual dissatisfaction has been the result, and blame sometimes bestowed where it was least deserved. In order to introduce the boiler into the building, the wall adjoining the door or window had to be cut away, causing a weakening of the whole structure; or where the height was insufficient the floor beams had to be cut away, to the detriment of the general strength.

Boilers of the locomotive type are sometimes ordered, on account of the height required not being so great as in some other form, but in many instances a locomotive boiler, in the hands of a careless fireman, is a constant element of danger, as the crown-sheet, being ordinarily flat and frequently insufficiently braced, exposes a large surface to the action of the fire, should the water be allowed to run low, and in case of the introduction of cold water to conceal the neglect of the fireman, a rupture or distortion of some kind is sure to follow.

In my experience, as a practical boiler builder, numerous instances have come under my observation where unmistakable evidence was presented of low water, both in the locomotive and other types of boiler, yet the engineer, or fireman in charge, would unblushingly assert that "he had three solid gauges when the leak was discovered, and in fact never allowed the water to get below the level of the second gauge." In taking into account the real wants of a man placed in the position represented at the beginning of this paper, other questions are to be considered, besides that of present economy. The durability is to be taken into account as well as the feasibility of repair when repairs are needed, and frequently the boiler possessing the greatest amount of evaporative power is found to be expensive in use and almost incapable of being repaired.

The boiler most popular in this country to-day is the horizontal tubular, and from my own observation and experience, it is, in the end, the most economical in every respect. When properly made, of good material, either iron or steel, with due attention given to the quality of water used, ease of firing, durability and ease of repair, I think it stands to-day at the head of the boilers in use. One fault to be found in the horizontal boilers generally made is the crowding of too many tubes into the least space, in order to give the greatest nominal evaporative power and to reduce the space occupied to a minimum point. This practice is, to say the least, injurious, as there is no allowance made for the free circulation of water or the free escape of steam, when generated. The tubes are placed close to the shell and down to—sometimes below—the hand-hole plate in the front. As a consequence these superfluous tubes become choked with ashes, and, in time, corrosion and weakness are visible in and around them. I know that some boiler makers will question the correctness of this statement, but it is founded on experience rather than theory.

I have no intention of running down the invention of any one boiler in this article, I simply write as a practical boiler maker, and write from experience. Where bad water for steam boilers can only be had, incrustation is the result, but at a slight expenditure in the construction of a suitable cistern, incrustation can be prevented by using rain-water, two or more days in each week. The proper manufacture of the boiler requires a due attention, even to the minutest detail. The thickness and quality of the plate, the number and size of flues, the diameter and length of shell, and the diameter and height of steam dome (where a steam dome is insisted on) are all to be considered. The thickness of metal required in the shell of a boiler where the flame comes in contact with the shell, is a matter that deserves more than passing notice.

The law governing the Steamboat Inspection service, Revised Statutes of the United States, Sec. 4,434, says: "No boiler to which the heat is applied to the outside of the shell thereof, shall be constructed of iron or steel plates of more than twenty-six one-hundredths of an inch in thickness, the ends or heads of the boilers only excepted; and every such boiler employed on steam vessels navigating rivers flowing into the Gulf of Mexico, or their tributaries, shall have not less than three inches space between and around its internal flues." The pressure of steam allowed on iron or steel boilers of this thickness is also provided for according to the tensile strength of material, and my practical experience, as a boiler maker and repairer, justifies me in saying that the principle of that law is correct. Any man accustomed to boiler repairing will notice that, in cutting away part of a defective plate, the surface exposed to the action of the fire is exceedingly hard in a thick plate, and has all the appearances of crystallization. This shows that the water contained in the boiler protects the metal to a limited extent of its thickness, and this limit, I think, is pretty correctly reached by the provisions of the statute referred to.

The man and hand-hole plates should be placed where they can be most effective for their intended use. My custom is to put the manhole in the shell, reinforcing the weakened part by a substantial cast-iron frame riveted to the shell, placed either inside or outside, according to the custom and patterns in use in the locality. My preference is for the inside frame, as in this case the surface of frame and plate can both be planed, and a good joint insured in every instance.

Another question, in connection with the horizontal tubular boiler is, the distance between grates and bottom of boiler. In many cases there is not sufficient space allowed for the proper combustion of gases, and as a natural consequence a waste of fuel is the result. Thirty inches, in my opinion, is the least that should be allowed, and I have known of very good results when thirty-six inches was given.

The setting of the boiler was referred to by me at length, in a previous article, and a repetition at this time is unnecessary. Various ideas prevail as to the proper way and place to introduce the feed-water, my own custom being to carry it well into the back end of the boiler, where, if precipitation takes place, the sediment can be mostly removed by an occasional use of the blow-cock. The con-

nections to the engine should be arranged in such a way that there should be no rigid points in the steam-pipe, to throw a strain on either steam-chest or dome; the judicious use of an elbow, often leading to considerable saving, while the neglect of proper precautions does incalculable injury.

Properly set, the ordinary boiler here referred to, can be made to burn almost any kind of fuel, and in order to do this a grate of the proper opening is necessary. If the opening or air space is too large, waste of fuel is the result; if too small, an improper supply of oxygen to mingle with the carbon and other products of combustion is sure to follow, in which case fuel is burned without corresponding benefits. There are few boilers where any greater amount of power can be put in much less space than where the horizontal tubular boiler is used, but it requires judgment and experience in matters of this kind to utilize the space usually allotted to the boiler.

Not wishing to advertise the merits or demerits of the patented boilers, I make no reference to them by name. Many of them possess good points, but the good points are more than balanced by the poor ones. I have had an acquaintance with all of them, and my opinion of the horizontal tubular boiler is based on that acquaintance.

Draft-Regulating Appliances of Locomotives.

By J. Dugald Campbell.

SECOND PAPER.

We will now consider the appliances used to create a draft, and will commence with the stack proper, with the lifting pipe as part of the stack when used in connection with the short exhaust pipe.

In the problem of draft we have three factors, viz.: a varying quantity and pressure of steam from the cylinders, the dimensions of the exhaust pipe and the dimensions of the stack. In order to get a good result we can readily perceive that there must be harmonious relation in the dimensions. Were the quantity of exhaust steam constant we might easily be able to settle upon a proportion between the parts, but the quantity of steam passing out being as variable as the work the locomotive has to do, we can only adopt a mean proportion between them that will enable them to produce a draft under the two ways it is done in a locomotive, that is by induction into a vacuum or induction caused by friction.

When a locomotive is at work at ordinary speed induction of draft is to a certain extent operating by both methods. But when working at low speed and high cylinder pressure of steam it will be found that the draft is produced by the first of the above means alone, the exhaust steam forming a piston in the draft pipes that expels the air from them. The void left behind is filled through the flues and fire-box by air that passes in through the grates. The amount of air drawn in this way will be found to bear a close relation to the ratio of stack capacity to that of the flues, smoke-box and fire-box. By induction of draft by friction is meant the method, where a current of steam by rubbing against adjoining air creates a current of that air or other surrounding gas.

Some aid is given to the method of induction into a vacuum by the other or induction by friction. At high speeds and early cut off in the cylinder we have an increased number of exhausts and a decrease in exhaust pressure. The exhausts follow too closely to allow of much benefit by induction into a vacuum and induction by friction becomes the principal means of draft, and the other is secondary to it. The reverse of this is in operation at low speed.

We can now consider the best means of creating a draft by these two ways with the appliances we have. In the first one we will find that the draft pipe should be large as possible, so long as the exhaust steam will fill them with a volume sufficiently compact to hold together and form a piston. To produce this result, much depends upon the shape as well as upon the size of the exhaust pipe nozzles. They must be constructed so that they will fill the draft pipes at the lowest point, and allow all the steam to enter them without striking with a sharp angle on the sides. When the exhaust steam strikes on the sides of the draft pipes as shown in Fig. 1, the cohesion of the body is partly broken, and straggling steam is thrown off which falls behind the main body and fills the space

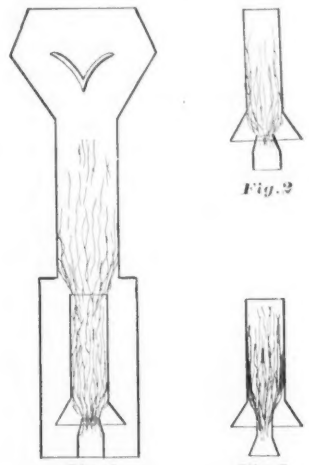


Fig. 1

Fig. 2

Fig. 3

which should be filled by the gases from the box. The compactness of the body being destroyed, in place of a compact piston we have a long drawn out column of steam that but partly fills the stack, and is so long in its passage through that it is overtaken by the next exhaust.

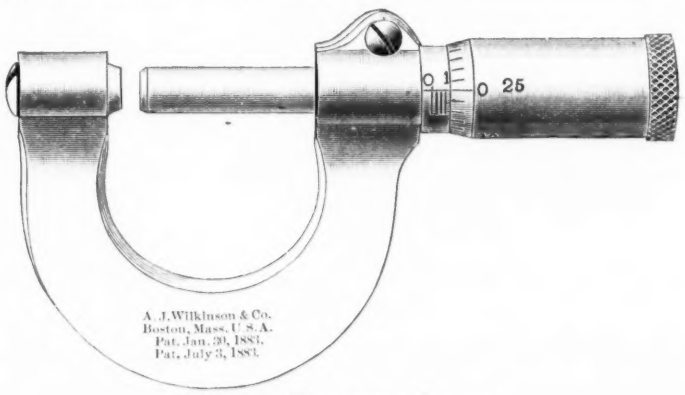
When induction by friction comes into action, any cause that leads the exhaust steam in an oblique direction is still as detrimental as when induction by the other means was in force. The action of the exhaust in producing draft is similar to the action of the water injector, and is controlled by the same laws. With this, as with the injector, the friction of the steam and air and the lifting of the latter is done by their meeting at a certain angle, and not by the steam rushing into the air. When the draft appliances are badly designed or out of order, the steaming will be affected, just as the satisfactory working of an injector is out of the question when the water and steam tubes are out of proportion or out of line.

One of the common methods of attempting to remedy bad steaming that results from structural defects, is contracting the nozzles. This is trying to correct one mistake by adding another. Closing the nozzles will often improve an engine's steaming by increasing the force of the exhaust, enabling it to overcome the structural defect; but that is an expensive way of rectifying the matter. A better method is to harmonize the draft appliances, just as we adjust the tubes of an injector that is working badly through wear. In doing this, it is a good plan to direct the draft after it leaves the nozzle by the nozzle's shape, and is one that will often result in allowing the use of an increased diameter of nozzle. The depth of the straight bore of the nozzle will nearly always influence the direction of the exhaust after leaving it. This is illustrated in Figs. 2 and 3. In Fig. 2 the cylindrical portion of the tip is short, and the steam has begun to spread almost from the point of its departure. In Fig. 3 the sides of the tip are parallel for a longer distance than the other, the result being that the steam gets inside the lift pipe before it spreads.

Snow-Plowing Inventions.

The unusually severe winter experienced a year ago, when snow obstructed many North-western roads for months, set the inventive talent of the country to work to devise a means of vanquishing the snow banks. Practical railroad men had tried many devices for snow fighting, and, after many years of experience, they had settled down upon certain forms of plows whose leading features are well known. It now was the turn of the empirical inventor to try his hand on snow-plow designing. The Exposition of Railway Appliances, held in Chicago last June, was taken advantage of by many snow-plow inventors to bring their productions to the attention of railroad men; and some devices exhibited there were fearful and wonderful emanations of inventive labor. They consisted mostly of independent power attachments, which could be run ahead of a locomotive. Some of the inventors of the devices reclined on the grass of the Exposition Annex, and loudly expressed yearning to find a mountain of snow that they might show the world the irresistible character of their inventions. Before the frosts of winter reached us, the list of formidable snow weapons was increased by torpedo-charged plows, bristling with explosives that promised to toss the snow half way to the moon. We have been watching the movements of the new-fangled snow brigade very closely, and found they were tremendously noisy about their projected operations so long as the temperature remained at summer heat; but as winter approached, their voices were like the note of the swallow—gone from among us. A tolerably hard winter has come and gone, and some snow blockades have been reported from different parts of the country, but where were the men with the revolving snow plows and drift-destroying torpedoes?

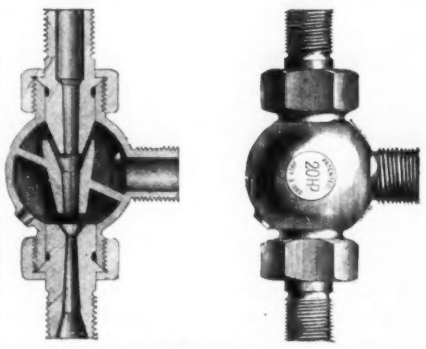
The fact is, that a set of inventors undertook to prepare apparatus for fighting snow who had never seen the effects of a real snow-storm. We observe in this week's *Patent Record* another candidate for failure, who proposes to put revolving fans in front of the engine truck wheels to clear away the snow, the power being applied by two rotary engines. The idea is simply absurd, and never would have been thought of by any man who had seen a train blocked in deep snow. This inventor and all the others who have expended Patent Office fees on complicated gimcracks had better leave the designing of snow-fighting appliances to the men who understand what work a device for that purpose is required to do.



Improved Micrometer Caliper.

E. Mansell, Coldwater, Mich., writes: "In setting up the article I sent you, "How to Clean a Boiler," published in No. 10, Vol. 7, occurs a mistake in spelling and punctuation, which conveys a different meaning altogether from what I intended in the original MSS. The mistake occurs in the following sentence in 13th line of 3d column on 6th page, viz: "The manhead is then removed, sediment blown off; cock opened and all the water allowed to flow out of boiler." It should read as follows: "The manhead is then removed, sediment blow-off cock opened, and all the water allowed to flow out of boiler.'

As published, it would convey the impression that the boiler was blown off after the manhead was *removed*, which could not be done; in fact, I never empty a boiler of its contents *under pressure*."



"Little Wonder" Injector.

The "Little Wonder" Injector.

This injector is designed for feeding boilers under conditions where the water always flows to the instrument, and is very simple in the number and arrangement of its parts, all of which are permanently fixed, so that in working none but ordinary globe valves are used. As it has but one passage, and that a direct and unobstructed one, any foreign matter that may become lodged in it can be readily removed by inserting a wire. It is said not to be affected by overheating, and that it will feed directly from the hot well of a condensing engine. It is made by the Delaware Steam Appliance Company, Wilmington, Del.

Improved Micrometer Caliper.

The improvement in the micrometer caliper shown with this, consists principally in covering the screw so that no part of it is exposed to dirt, which by lodging in the threads may strain both screw and nut. This also protects the screw against getting accidentally damaged in any way. The construction is such that adjustment, for wear, may be readily made. These calipers are made in two sizes,—one and two inch—and for either English or metric measure. They are manufactured by A. J. Wilkinson & Co., 184 and 188 Washington Street, Boston, Mass.

Tests for Color Blindness.

The question of color blindness now receives regular and systematic attention from the officers of the Pennsylvania Railroad, and all applicants for positions in train service are subjected to an examination before they receive employment. We have been much interested in the way the examinations are carried on in the office of Mr. Thomas, engine foreman at Jersey City. We requested to be subjected to the regular examination, and the obliging officer consented, so having gone through the mill we can speak authoritatively of the test for color blindness. On the walls of the office a disk hangs, having letters upon its face of graduated sizes from a quarter inch long to two inches. Means are provided for changing the letters. When standing about twenty feet from the disk the candidate is required to read over the letters first with one eye, then with the other. This decides the acuteness of his vision. His field of vision is judged by his ability to describe the movement of the examiner's fingers when standing pretty close to him and looking the examiner straight in the eyes. For a color test he is given three strips of wool, green, rose, and red, and required to match them from about twenty-four strips laid on a board. If he does this correctly without hesitation he is passed. But the applicants very often make mistakes. If they are a little color blind they confuse pink with blue, drab and brown with green and yellow, and brown with red. About one man in 35 is color blind, and about one in 15 has defective vision in some way. As men who have had good sight for colors are liable to become defective from disease or other causes the train men are subjected to periodical inspections to test their vision. The plan seemed very simple and easy to us, and we passed "good" on every point. To those who happen "bad" the system may not be so satisfactory, but we think that safety in railroad operating is served by this precaution.

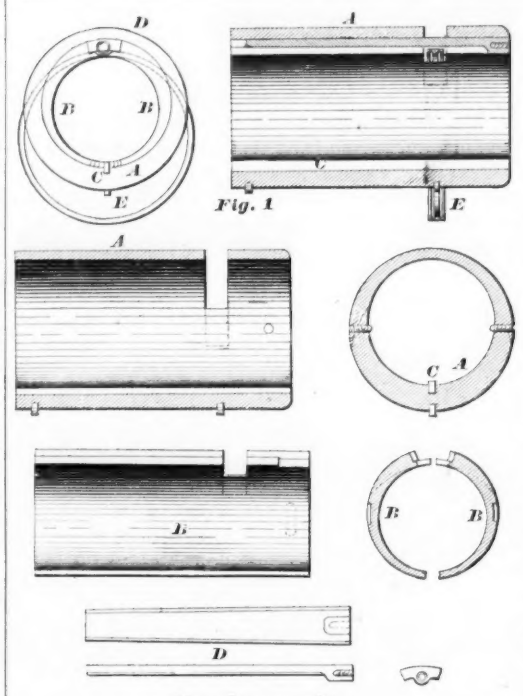
New Journal Box.

We present herewith detail illustrations of a new journal box, lately introduced by the Straight Line Engine Company in their engines. It is their endeavor to introduce, as far as possible, the merits of a solid box with one that can be adjusted, and one that, when worn out, can be renewed at the least expense and occasion the least delay in making the change.

Fig. 1 shows the complete box, and the other figures the details. It consists, as will be seen, of a solid outside shell *A*, fitted and secured in the frame of the engine. This shell is bored eccentric and to standard gauge, and within are placed two eccentric check pieces *B*, abutting at their lower edges against a babbitt metal feather *C*, and wedged in by a brass wedge *D* at the top. Several type metal liners are put in between the lower edges of the cheek pieces and the feather, which, as the box wears, can be removed and placed by the side of the brass wedge *D* at the top. By this change the cheek pieces, which are wedge shape, will slide down and close up the box. After all the liners have been changed, strips of considerable width can be cut from the lower edges of the cheek pieces, and the liners returned so as to get a second wear out of the original cheeks, or new cheek pieces can be substituted with the least possible stoppage of the engine.

There seem to be many good points about this box besides the main one aimed at. Aside from the gap at the top, which in their engine is of no account, the box is a solid one; giving way or getting loose is impossible, and there is no joint for the escape of oil either at the bottom or sides. The "take up" takes place in the direction of the greatest wear, and cannot be tampered with while the engine is running. In renewal there is nothing to be thrown away, and the possibility of making the cheeks in duplicate is an important item.

The cheek pieces are cast and hammered in a heavy cast iron mould, and afterward keyed in a jig and bored to gauge. In the Straight Line engine, the pounding of the main boxes is reduced to a minimum by the "anvil" element in the fly-wheels; but in places where the plain babbitt cheek pieces would be likely to hammer out, the babbitt can be cast in brass cages, not necessarily in a babbitt-lined brass box, but a brass skeleton introduced in the mould, around which the babbitt metal would flow. Simply brass ends, held together with tie rods to keep the babbitt metal from yielding endwise. *E* is an oil ring, used to return the oil from drip pocket to the top of shaft. The box may be used either with or without this.



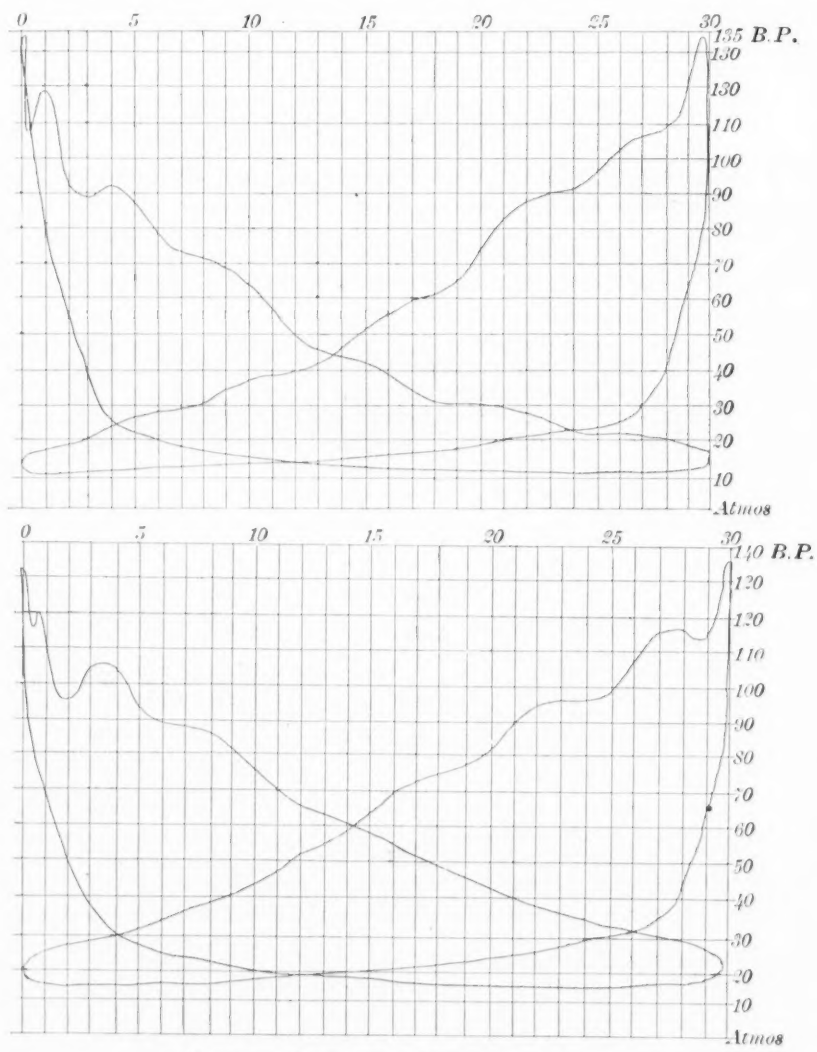
New Journal Box.

Work in the New York Central Railroad Shops.

At Forty-third Street, on Fourth Avenue, New York, on a block adjoining the Grand Central depot, are located the New York division shops and round-house of the New York Central & Hudson River Railroad. The shops are crowded into a quarter the space they ought to occupy, and consequently are inconvenient, yet a great deal of good work is turned out of them under the management of Mr. P. McQueen Gibson, master mechanic. They are very busy in these shops at present, a full force of men being employed.

During the course of a recent visit to this shop, we were pleased to note the progress towards uniformity of parts for their locomotives being made by the mechanical department of this road. The New York Central, like other roads that have absorbed small railroads, had a concourse of locomotives of all conceivable shapes and sizes, with no parts made to the same exact size. Mr. Buchanan, superintendent of motive power of the road, perceiving the expense in repairs caused by the great variety of sizes, moved towards effecting a remedy in the cheapest way it could be carried out. The plan adopted was to work all renewals towards certain standard forms. In the standard passenger engine which we saw in the shop, all parts are interchangeable with those of other engines of the same class. In repairing engines or tenders that are not standard, every part which can be changed to standard forms is put into that shape, even if it should be inconvenient to make the radical changes on the engine which would make the whole of it standard. This tends to reduce the number of patterns and pieces that must be constantly carried to be prepared for repairs. In the matter of springs alone the system pays. The standard engine has only three forms of springs—the driving, engine truck, and tender springs. In repairing an odd shape engine, it is often possible to make the springs conform to the standard, which is an important step in the right direction, and if the oil boxes can be also brought to the standard, it is so much the better. They have already made so much progress in this line that their engine trucks and tender trucks can nearly always be taken out when any repairs are needed, and another truck substituted. Many of the other parts are now almost entirely interchangeable, such as cross-heads, pistons, guides, guide yokes, rockers, and so on. Mr. Gibson is enthusiastic in favor of uniformity, and is vigorously extending its operations.

This company is using steel castings in many departments of locomotive work. In the machine shop we saw cast steel cross-heads, links, rocker arms, and guide yokes being finished. Steel has been adopted as the standard for these articles, and they are giving the highest satisfaction. We examined a cast steel hardened link there which was made in the Baldwin Works twenty years ago, and has been constantly at work all that time, and the temper has never been drawn. The link looks as if it were good for twenty years' more wear. The steel cross-heads have cast iron gibs, which are held in place by two nipples cast on the gib, which fit into holes drilled in the cross-head. The steel rocker shaft rests in a steel box lined with babbitt, which is part of the guide yoke. Several of these rockers have run upwards of 150,000 miles without repair, and are still in good order. There is an engine in the shop belonging to the New Haven and Hartford road, which has got a new boiler of Otis steel with the Buchanan fire-box. The engines with the extended smoke-box are fitted with a very convenient cinder emptying device invented by Mr. Gibson. The peculiarity of the rig is a middle removable ring, which on its top forms an air channel joint, and on its bottom forms the flat surface for the closing slide to make a tight joint on. When this gets worn and begins to draw air, the ring can be taken out and the flat surface trued up without disturbing the other part of the casting.



Indicator Cards from Stevens' Locomotive.

Indicator Cards of Stevens Locomotive at High Speed.

Some time ago we published indicator cards taken from a locomotive having the Stevens valve motion. The cards showed the steam distribution to be about as good as the best forms of automatic independent cut-off engines, but they were taken at comparatively low speeds, and we expressed the wish to see what the engine would do at high-piston speed. Mr. Stevens has recently been experimenting with the engine at high speeds, and he sends us two indicator cards which are published above. The piston speed at which the cards were taken was 1,190 and 1,390 feet per minute respectively. In a letter which accompanied the cards, Mr. Stevens says: "You will see by this print that engine 48, with 17″x30″ cylinders, is capable of attaining pretty high speed, having run up to a piston speed of 1,390 feet per minute. You will observe the card is a trifle short at one end; the short card was taken from the forward end of the cylinder, and is caused by the expansion of the stem of that valve in the steam chest. The steam passages in the cylinders of this engine, as you will notice, are very small (12″x1″). Hereafter I shall not make them less than 16x1″ on any engine constructed under my direction. This valve gear can be applied to any engine, no matter what the stroke of piston may be. I am putting it on to some 24″ stroke freight engines."

Machinery Notes from the Cincinnati, New Orleans and Texas Pacific Railway.

The Cincinnati, New Orleans and Texas Pacific Railway have two Mogul engines in their shops at Ludlow, Ky., undergoing a thorough repair. This company will soon order seventeen new locomotives and 1,500 box cars to assist in stocking up the progressing divisions of the road. Mr. Meehan, general master mechanic, has designed a hydraulic lift arrangement to take the wheels from under locomotives that are in for repairs. It consists of four hydraulic lifting cylinders located in the corners of the shop pit, with the necessary appliances for handling and connecting on to the engines. It will lift the heaviest locomotive clear off the wheels in two minutes.

At the division shops in Chattanooga several locomotives are undergoing change of gauge from 5 feet and 5 feet 6 inches to 4 feet 8½ inches. The driving-wheel gauge is changed by reversing the wheels, the dish of the wheel effecting a difference of 4 inches. Changing the tires accomplishes the remainder. This company have 350 coal cars and 1 dump car under construction for their road, in the Wason Car Works, Chattanooga. Those already in use are reported by the officials of the road as being the best cars they ever received.

Rebuilding War Locomotives.

A traveling correspondent sends us the following notes from Nashville, Tennessee: "At the shops of the Nashville, Chattanooga and St. Louis Railroad, at Nashville, several war engines are receiving overhauling. They are somewhat antiquated machines, but they have good material, and work can be got out of them for several years to come. They had boilers put in during the war, which are now being renewed. These shops were largely depended upon during the war to keep up Government engines, and the walls show the marks of bullets from Southern guns. This shop is remarkable for keeping up ninety-five engines with the small number of eight lathes, two planers, two drill presses and one or two other tools.."

They Quit Building Locomotives.

We are informed that the Cleveland, Columbus, Cincinnati and Indianapolis Railroad Company have abandoned the building of locomotives altogether. For nearly two years they turned out a new engine from their own shops every three weeks, but close calculation of the expense convinced them that they could purchase engines from contract shops cheaper than they could build them.

Mr. J. L. Hackathorn, master car builder of the Kentucky Central Railroad, has resigned, and his duties will in future be performed by Mr. A. H. Watts, superintendent of machinery of the same road. This company have recently built new shops at Covington, Ky., and fitted them out with $50,000 worth of tools.

The Steam Launch Fanny.

We present on this page engravings showing the construction of the steam yacht Fanny, designed and built by W. W. Gilbert, of Montreal. The cuts were made from the drawings used in the construction of the boat.

The hull is an ordinary ship's launch twenty-two feet long by five and a-half feet beam, and is very strongly constructed, and intended to stand the roughest work. In fact, this little steamer has often been run aground at full speed without sustaining any injury. The bottom is flat, and the boat can be hauled ashore to land her passengers and "cargo." She is very stiff; is an excellent sea boat, and well adapted for fishing and shooting.

The smoke stack is double, the inside one being slightly tapered, and has a cast iron base and top. The door is at one side, and the boiler is fed by a small Korting injector, and is fitted with gauges, steam whistles, safety valve, &c.

Steam is rapidly raised in this class of boiler, circulation is said to be perfect, and there is no priming.

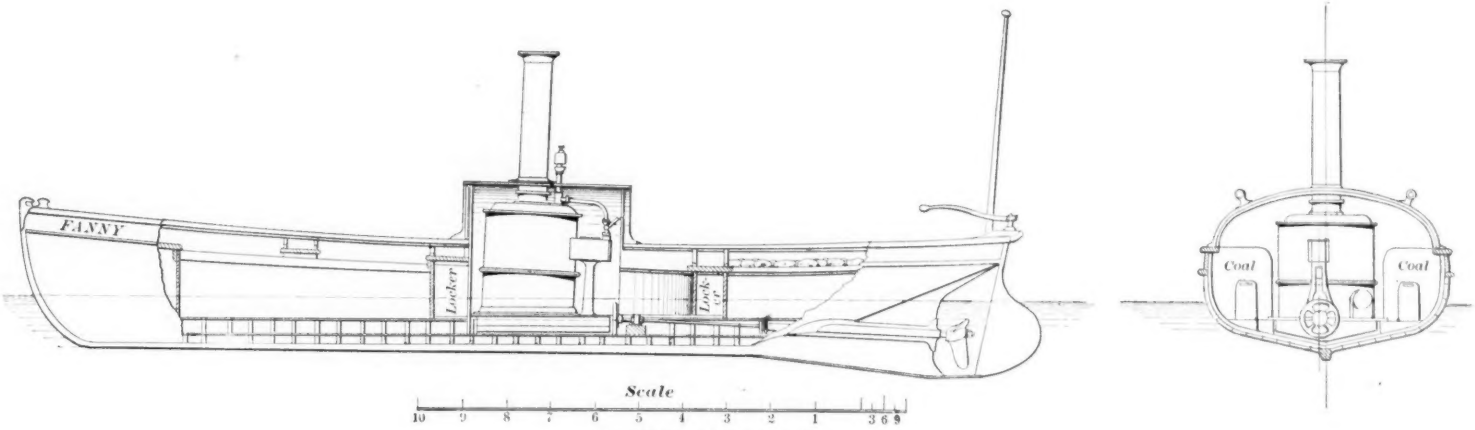
The engine cylinder is 4″ diameter by 4″ stroke, and is cast in one piece with the frame and crank-shaft bearings. The guides are circular and bored out. The whole is fastened by four ¾″ bolts to light iron brackets riveted to the boiler. Both piston rod and cross-head are of steel, and forged in one piece. The crank pin is 1½″ diameter, and the shaft the same size, and is fitted with a small fly-wheel. This wheel is coupled to the screw shaft by two small studs, which fit in corresponding holes in the half coupling on it. This connection leaves the shaft free to move slightly out of line, without jamming the engine shaft.

The link is shifted by a small handle on one side, and held in position by a thumb-screw on the link block. The eccentric rods and straps are cast in one piece, of hard brass, and the ends fitted with hardened steel pins. The end of the valve spindle is guided by a bracket cast on the lower side of the valve chest. The whole engine and boiler is bolted to a cast-iron bed plate, which is well fastened to the bottom of the boat.

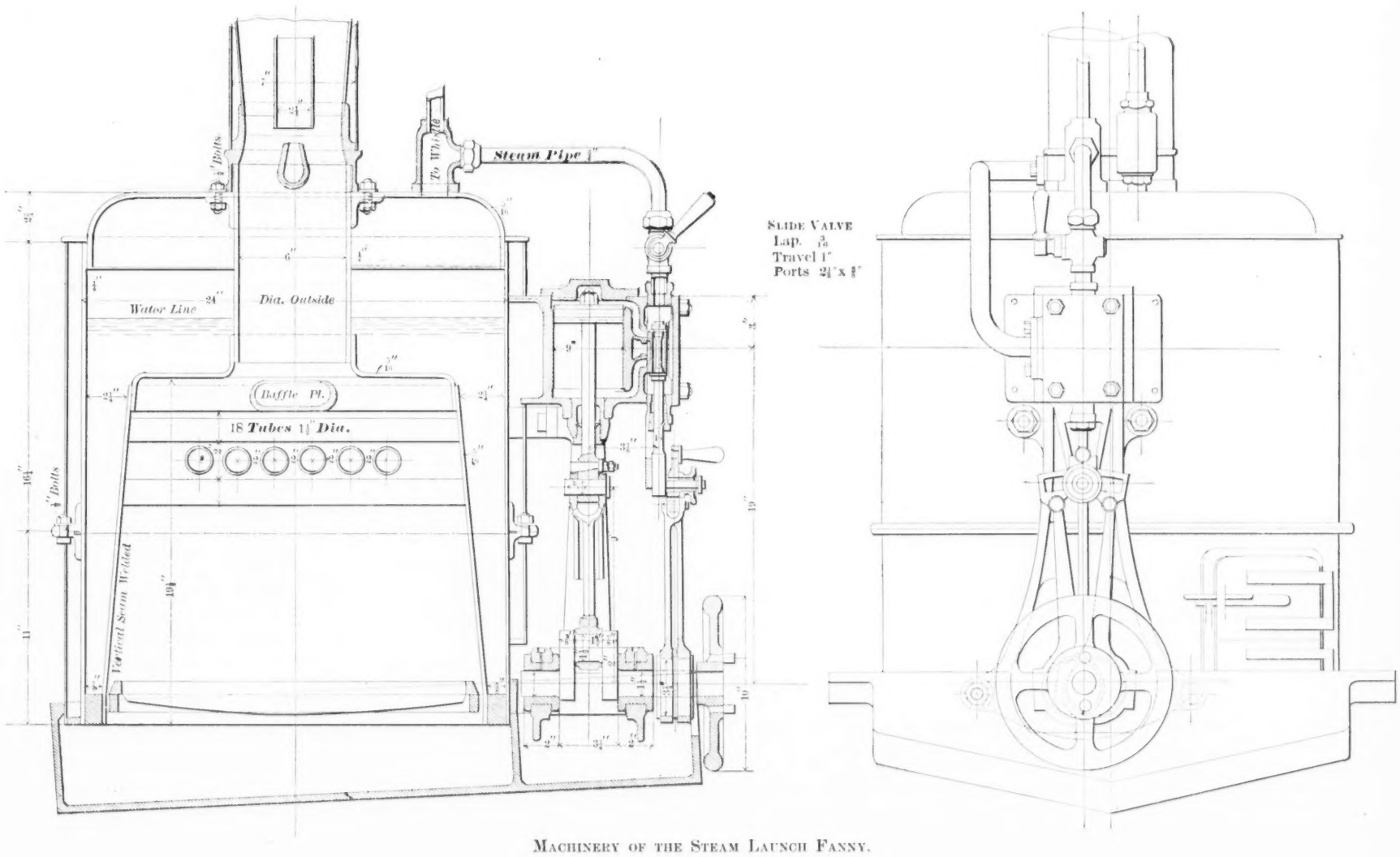
The center line of the engine, it will be noticed, is 2″ out of the center of the boat; this is to allow the screw shaft to clear the deadwood at the stern. The stem tube is bolted to the side of the deadwood and partly to the bottom, as shown in the drawing of the hull.

The shaft is steel 1⅛″ diameter, and is covered by a brass sleeve ⅛″ thick by 8″ long, running in a lignum-vitæ bearing in the after end of the stern tube. The screw is three bladed, 20″ diameter by 42″ pitch, and makes 300 turns a minute with 100 lbs. of steam.

This boat was successful from the start, and made a trial trip of 40 miles up the Ottawa, the first time under steam. She is easily managed by one man, and has comfortable seating capacity for ten or twelve persons. A speed of eight and a-half miles an hour is easily kept up, although the boat is very heavy and broad, and was intended more for pleasure and safety than for speed.



THE STEAM LAUNCH FANNY.



MACHINERY OF THE STEAM LAUNCH FANNY.

Continuous trips of 100 to 150 miles were made last summer. The boiler is of the vertical cross tube type, and is 24″ diameter and 30″ high. The furnace is circular, 19½″ high, with the vertical seam welded, and contains 18 cross tubes, 1½″ diameter expanded in their places. The uptake is 6″ diameter and is partly throttled at the bottom by a cast iron baffle plate, which stops the too free exit of the hot gases up the stack.

It will be observed that the outer shell can be removed, and the interior cleaned or repaired, the joint being made by turned angle rings bolted together. This is easily made, and gives no trouble whatever. The pressure is usually 120 lbs. per square inch, although a much higher pressure is sometimes carried.

Welding Boiler Joints.

An inventor in Scotland has patented in this country apparatus for welding the seams of steam boilers. For this purpose he employs a modification and extension of the roller flue-welding machine, well known in the United States, and extensively used in railroad shops. The device consists of a hydraulic cylinder and ram, the ram being fitted with two rollers—one to roll along and operate with welding pressure on the joint, and the other to roll along the opposite part of the shell in combination with external blocks, which confine the shell and prevent its enlargement during the operation. There is no reason why a boiler shell should not be treated like a flue, and the joint welded instead of being riveted. Quite a good many experiments have been made with welding boiler seams, but the results have not encouraged boiler-makers to extend the practice. Perhaps the welds may prove more satisfactory when they are made with a heavy machine designed for the purpose.

We receive a number of inquiries every week asking the horse-power of boilers and engines. The horse-power of a boiler is a meaningless expression, because there is no agreement as to what evaporation of water shall be considered a horse-power, and hence no standard in law or practice. The expression is properly enough used by boile makers as expressing the relative capacity of different boilers, as it is a matter of necessity for them to use some form of expression, and in the absence of something definite this is perhaps as good as any. The horse-power of an engine can only be determined by actual trial; but if the dimensions of cylinder, valves, and ports, together with the character of valve motion, the speed at which the engine is to run, the boiler pressure, length and diameter of steam and exhaust pipes, and the use to which the engine is to be put are known, the horse-power that it will satisfactorily develop can be reasonably approximated. These data seldom accompany the queries, and hence they are useless for the purpose for which they are intended.

LETTERS FROM PRACTICAL MEN.

Boiler Setting.

Editor American Machinist:

In further answer to A. N. T., Question 103, March 8th, I know of long blast-furnace boilers, giving excellent results, which have a space open to the ground level *immediately* behind first bridge wall and grate. The space is about six or seven feet long to a second bridge wall, from which, to back end of boilers, the space is filled in and paved *concave*.

The boilers are fired with gas, and open space is intended to allow thorough mixture of gases and air *while hot*. The united and burning gases are then held up to the boiler until utilized. I think the same plan should work well with soft coal. M. E.

Benwood, W. Va.

The Accuracy of the Indicator.

Editor American Machinist:

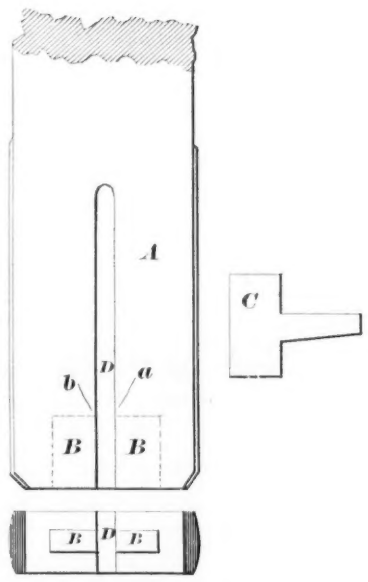
I enclose a diagram which shows, I think, very clearly the accuracy of the indicator. Even at the present day there are those among us who do not believe the indicator is accurate. More especially for the benefit of these I present this diagram, as one of the proofs that an indicator, in proper condition in all respects, does indicate changes of pressure by so rapid and truthful a movement of pencil as to make its indications plain and accurate enough for all practical purposes.

I have, in connection with other engineering practice, made a careful study of compression, and have at many times doubted, not without good grounds either, the accuracy of compression curves as drawn by the indicator, and have found a wider difference in this respect in different instruments than in any other. Each different make of instrument appears to make a characteristic compression curve. Use one indicator after another on the same end of the same cylinder, and you have as many different compression curves as you have indicators. If all the instruments are in good condition the difference will be slight, yet it can be detected. The difference may generally be covered by twice the width of an ordinary line, which goes to prove that the indicators are accurate within practical limits.

The diagram shows with wonderful correctness an action which I knew to be taking place, and yet which I had no idea the indicator could portray so graphically.

There was at first in the engine a natural compression, raising the curve but little above atmosphere. Afterward the exhaust closure was hastened, but the desired rise of pressure was not obtained, until brought about by admitting steam in a limited amount to assist compression. Four $\frac{5}{16}''$ holes were drilled so as to be uncovered by the valve admitting steam to the cylinder at about the point *b*, on the diagram. This not being sufficient, other two holes, same size, were drilled so as to be uncovered at about the point *d*, so that when the diagram was taken, two $\frac{5}{16}''$ holes were open from *d*, to *b*, and six from *b*, to end of stroke. Does any one doubt the extreme delicacy of an instrument that can represent these actions so correctly? By drawing the quadrant *e f*, and projecting the points *a*, *b*, *c*, *d*, upon it, we find the time required from *d* to *c*, or from *b* to *a*, is .005 of a second. The distance a body would fall by gravity in .005 of a second is .0048 of an inch. The actual rise of pencil from *d* to *c*, is about; $\frac{1}{16}''$; then that of the piston is .015 inches. The forces varying as the height, that required to cause this movement of indicator piston is 3.1 times its own weight. If the piston weigh one ounce per square inch of its area, the mean pressure required to cause the movement would be $\frac{1}{16}''$ of 3.1=.193 pound per square inch, or about one-fifth of a pound. There is no mystery then, as it appears quite possible that an instrument should respond to changes of pressure as quickly as represented from *d*, to *e*, without being inaccurate in a greater degree than one-fifth of a pound.

ED. F. WILLIAMS.



An Adjustable Drill.

Editor American Machinist:

While reading the troubles of the small-shop man in the large shop, a few weeks ago, regarding chuck drills and reamers, it occurred to me to suggest an improvement in the shape of the finishing drill of a set, where sets of drills are used to precede a reamer, more particularly in sizes over $1\frac{1}{4}''$ or $1\frac{1}{2}''$ in diameter. About four months ago, I fixed over a $1\frac{5}{8}''$ finishing drill of a set, as shown in the sketch, and although it has been in almost daily use since that time, it has not visited the blacksmith, and to all appearances will not require to do so for a year to come.

Shops that are using large drills, on special work, will not find it a very expensive process to fit up their finishing drills of sets in this way, and will be more than repaid in the economy and convenience of being able to instantly adjust the drill to proper size, when worn small, without the necessity of visiting the blacksmith, including, probably, waiting until that hurried job is finished. This is to say nothing of the time and skill required to bring the drill to proper shape and size again.

This drill may be made by drilling a sufficient number of small holes and punching out the chamber *B*, before the split *D* is made. This chamber might, especially in larger sizes, be milled out by making the slot *D* wider. The piece *C*, is made thick enough to fill the slot, so as to resist torsion when the drill is cutting. The wedge shaped end of *C* extends into the slot *D*, bearing against the corners *a*, *b*. To expand the drill this piece is simply driven in a little further. It should be understood that the design is not to make a drill for different sized holes, but to provide means for keeping it up to size, as it wears by use.

The safe limit to spread can be found by carefully wedging apart and calipering the size, then fit the piece *C*, so that when driven down to the shoulder the size will caliper the same. In this way all liability of breaking is avoided. If the piece *C* fits the slot, the drill will cut as steadily and smoothly as if it were not split.

If the last drill of our friend in the large shop had been made in this way, when he broke the arms of his first pulley, one light tap of his hammer on the end of the piece *C*, would have relieved him of all his latter troubles. CHARLES J. PRANKARD.

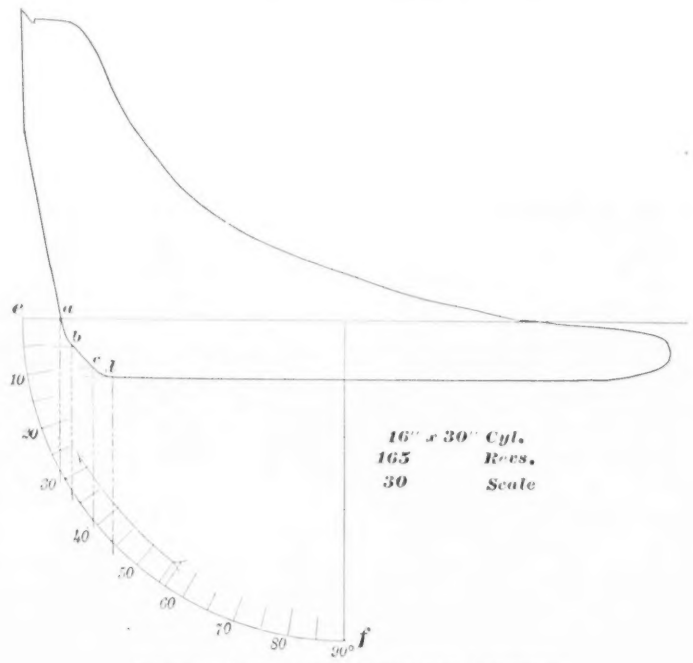


DIAGRAM ILLUSTRATING INDICATOR ACCURACY.

The Moulder and Pattern Maker.

Editor American Machinist:

Mr. Isaac Whitehead, in his practical writings upon pattern making, mentions in the AMERICAN MACHINIST of March 15, 1884, a few points in relation to moulders and pattern makers, which, in concert with Mr. William Hultgram's article of January 5, 1884, are worth note and discussion. Mr. Whitehead correctly remarks: "The moulder and pattern maker are partners." Were this point better accepted and instilled into our work, there certainly would be much benefit derived.

The pattern maker and moulder are, as a general thing, about as congenial as a cat and dog. The moulder might be called the dog, for he is the growler. All this discord is simply brought on through ignorance, sometimes of one side and again of the other. In Mr. Hultgram's article is the somewhat egotistical expression, "consult nobody," and further on, as a sort of an offset, he puts the words into the moulder's mouth: "You make the patterns right, and I will make the castings."

It is evident Mr. Hultgram knew that did he consult anybody, he would have been as wise in the end as he was in the beginning. Some may think I am on the pattern maker's side. Well, in one way, I am. I have seen so much of "smart Aleck" business among moulders, that it has often made me feel disgusted. There are a great many who can show great mouth wisdom, and find fault with details when jobs are completed that in reality were so far above their conceptions they have not the least idea of the difficulties attending or the thought and skill required. One never hears such men approving anything. They open their mouths only to find fault.

Instead of finding fault with patterns, we ought to feel thankful they are as handy as they are. It is no trifling matter for a man to take the general run of drawings, and therefrom conceive and fully plan in his mind to perfection all the details of a pattern. The pattern maker, as a general thing, does well, when we take into consideration what he has to contend with.

In pattern making, perfection should not mean completeness. At the present day there is a class of work that can be moulded with far from full complete patterns. My idea of pattern making perfection is for the pattern maker to have his work as complete as is necessary for economy in final results. There have been thousands of dollars misspent in making patterns. Many expensive full patterns have been made to cast one or two castings, where a few sweeps and pieces of patterns would have answered. Then, again, there are patterns that should have been neatly and strongly constructed that, had the money and labor wasted upon others been expended upon them, would have been good and long-lived patterns.

This wastage of money and labor will continue just as long as we ignore each other's branch, as is now generally done. We certainly are partners, and Mr. Whitehead is right if he does step into the foundry and help construct moulds. In fact, much benefit would accrue if all pattern makers had to work a year or two in the foundry before they started to learn their trade. While the pattern maker has a right in the foundry, the same privilege should be accorded the moulder in the pattern shop. I do not care how long an experience a pattern maker may have, the moulder should be consulted before the commencement of patterns; and were I proprietor of any establishment where the foreman moulder and pattern maker were at loggerheads, or the foreman moulder was not capable of advising the forms and plans of construction, I would feel money was being wasted. The foreman pattern maker in our works is a man of nearly 50 years' experience, and is one I would match against any for practical knowledge in the economy and science of constructing patterns. Although he has such skill and experience, he seldom starts any of our patterns for new work without first consulting the foundry foreman.

In this age of the specialist, it would be folly for one to set himself up as knowing more of another's business than he does himself. Any business is not worthy the name of "trade" if it does not daily add to one's experience. I think that moulding and pattern making can with safety be classed as "trades," and that in both there is knowledge that can only be obtained by practically doing the work. Therefore, as we are partners in assisting each other to accomplish the end—"castings"—it becomes a necessity that each one's acquired experience should be made use of in order to insure the most expedient and economical plan.

THOMAS D. WEST.

Licensing Engineers.

Editor American Machinist:

I was not a little surprised at the report, as published in your paper a short time ago, of the Committee of the Franklin Institute on the subject of licensing engineers. Although it may seem presumptuous, I venture to say a word in favor of license, although it has been negatived by so learned a body. The old idea of steam boiler inspection was certainly a failure, as practiced in the part of the country where I was running an engine a few years ago.

It seems to me now, as it did then, that the only proper thing to do is to *inspect the men in charge*. This done, a license is only a certificate of competency, and is as much for the interest of the people at large as for the engineer.

If I state the case as it existed ten years ago (and certainly, to the best of my knowledge, it is no better to-day in this vicinity), it may call attention to a something which may exist in name and law, but yet have no real existence after all. The inspector (?) for our place used to come around with a wagon of the style grocerymen use, drawn by two horses. He also had a man to do the *work* for him, while he made out the certificate of inspection and collected $12.00 in the name of the State of New York.

We got a letter from him a few days before his intended visit, ordering us to be ready for inspection at a certain time, and to have the boiler filled with water up to the safety valve.

We were ready at the appointed time, and, after waiting six hours, our shop and of course business being thereby damaged to that extent, he made his appearance. He had a

two-cylinder hand force pump, which he brought in, and, after some fussing, got it attached to the boiler. He then inquired how much pressure we wanted to carry, and, being told 80 pounds, he put on a pressure one-half more, or 120 pounds, when he informed us the test was over, and we might fill up as soon as we pleased, which was surely a very pertinent remark, as it was then about 6 P. M. During the test I asked some questions for information in regard to the proper care of the boiler, to none of which I got an intelligent answer. So passed off the first year's inspection.

The next year he came again, but had left his pump somewhere. However, he borrowed a small hammer, with which he reached in the fire-box and struck the plate, not to exceed five light taps, when he informed us that that test was completed and he must have $7, but he finally consented to take $5, of which sum he informed me that the State was to receive $2. I talked with him a little while, and elicited this information: He had never run an engine or had charge of a boiler in his life, and knew nothing whatever about their practical workings, which only confirmed an opinion I had already formed. It seems to me that even a poor system of inspecting the men in charge would be infinitely better than the farce just described.

It seems as if some men might be found in the American Society of Mechanical Engineers who would be competent to examine the inspectors, and then, if the fee for license was small, there would be no trouble about it. It is only a few years since they required a license on our inland lakes, but now none is required.

C. S. BEACH.

[We believe Mr. Beach is mistaken in regard to a license not being required on inland lakes.]

Using Cotton Belts.

Editor American Machinist:

In your issue of March 8 a correspondent wishes to know as to the wearing qualities and best way of fastening cotton belts.

We have had several 2″ cotton belts in use for about a year. We lace them same as leather, except make holes a little deeper from ends, and use an awl, not punch. They appear to wear good and are strong, but the great trouble is, they tighten and loosen with the weather like a clothes line. I am running a 15″ lathe with one. In the morning it will be tight; in the afternoon, as the atmosphere is warm and dryer, it is too loose. If the day is damp, it will keep tight all day—perhaps a week. We are running a grindstone with one; the belt runs to it in a slanting position, and in the morning, if the atmosphere is damp, it tightens up so hard that it raises the other end of the frame, and it stands reared up like a kicking mule on its forward legs. S.

Owego, N. Y.

Tools for Angular Work.

Editor American Machinist:

I will endeavor to fulfill the promise made you some time since by giving you a description of the accompanying drawings of tools designed by me for angular work. There are no patents on these tools, so any one is free to make and use them.

Fig. 1 represents a convenient tool for measuring any kind of taper holes or plugs, such as lathe centers, ends of piston rods, bolts for connecting rods of locomotives, etc. It is arranged to measure the exact taper to the inch by $\frac{1}{1000}$, by means of the vernier. One leg is allowed to slide on the bar in order to get the proper diameter, the angle depending wholly on the quadrant, which can be moved either way for out or inside measurement, by means of the worm and gear. There are twenty threads to the inch, and the collar is divided into fifty parts. The legs may be of any desired length. The only important dimension is the radius of the quadrant, which must be one inch. The outside edges of the legs should be beveled to a point in order to describe a straight line when placed in a taper hole. When the pointer corresponds to the zero line on the quadrant the legs or jaws are parallel with each other. By turning the vernier one space, the jaws will show exactly $\frac{1}{1000}$ inch taper to the inch. If the taper to the foot is desired, it can be had by simply dividing the number of one-thousandths indicated, by twelve.

Fig. 2 is a handy tool for planer work, such as slide or compound rests, where it is desirable to have one or more perfect angles. Much has been written about imperfect graduating on planer heads, but as yet I have seen nothing which explained the real difficulty. This I consider to be in the planer cross head, not in the graduating.

I have never seen a planer that had been used any length of time where the cross head was parallel with the bed, owing to some careless workman attempting to raise or lower it after loosening the bolts on one side, only which will naturally strain the nut or gears sufficiently to throw it out of line.

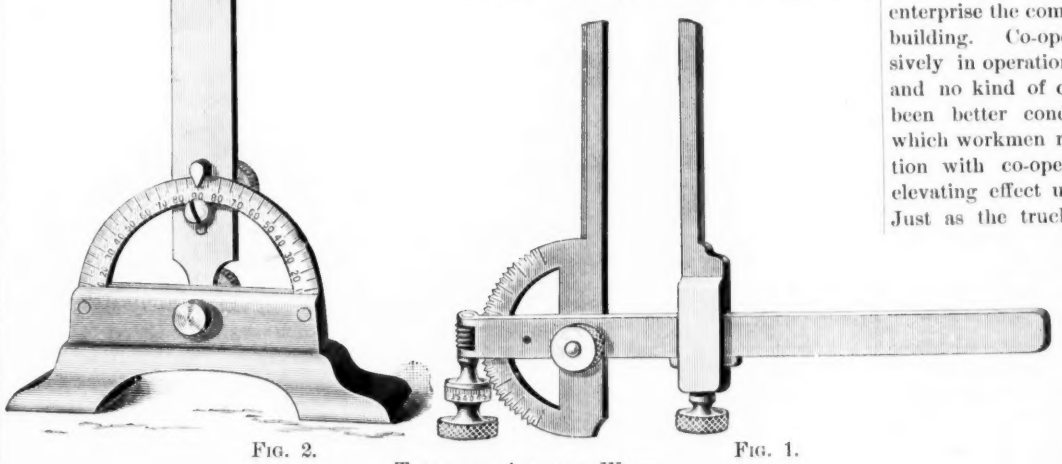


FIG. 2. FIG. 1.

TOOLS FOR ANGULAR WORK.

Any mechanic will readily see how utterly impossible it would be to plane a piece of work to an angle of, say 45 degrees, with the cross head out of true, if he set to the line on the head, and at the same time two opposite angles planed from the same line would not be alike, owing to the same cause.

This tool consists of the base and quadrant, which is graduated to degrees, the swinging blade and the pointer. By setting the pointer to the degree desired to be planed, then placing the tool on the planer bed and setting over the head until it is in line with the blade, a perfect angle can be planed. After planing one side, if a dove-tail is to be planed, place the tool on the opposite side and reverse the head. Speaking of imperfect planers reminds me of a recent experience of my own. A wrought iron gib, four feet long, two inches wide, and half-inch thick was to be planed, and for convenience was placed on a small planer, which had been used almost exclusively for many years for very short work. When the job came off I found it $\frac{1}{32}$″ thin at one end. After thinking it over for some time, I came to the conclusion that it was owing to the V's becoming worn at one end, in consequence of the very short stroke at which it had been run, there being about two feet of the bottom V's which the bed seldom passed over.

I wish the subject of accurate measurement might be sufficiently agitated in the AMERICAN MACHINIST to impress mechanics at large with the importance of $\frac{1}{1000}$ part of an inch. I have often heard quite well-informed mechanics laugh at the idea of so close measurement, yet it is a very easy matter to do with a micrometer caliper. It seems a pity that such tools cannot be had at a price within the means of the ordinary mechanic. I consider it by far the simplest tool to make for close measurement. I have one of my own make, which answers every purpose. E. W. JOHNSON.

Good Results with the Dunbar Packing.

Editor American Machinist:

Engine 53, in passenger service on the Cincinnati, Hamilton and Dayton Railroad, running between Lima and Toledo, has made one hundred and seventy-two thousand (172,000) miles without having the cylinder heads off to repair or replace the packing. The Dunbar packing is used, and is yet in good condition to make several thousand miles. This not only speaks well for the packing, but also for the care it received as to proper lubrication. R. E. STATE.

Lima, O.

Heating Railroad Cars by the Locomotive Exhaust Steam.

The Glasgow *Engineer* gives particulars of the recent test of a heater for railway carriages made on a Scotch railway, where the exhaust steam from the locomotive was carried through the train by means of iron pipes, the connection between the carriages having been made with flexible hose similar to those used for the Westinghouse brake. The amount of heat obtained in the carriages was not of an oppressive character, but it was better than no heat at all, as is the ordinary condition of British railway carriages, and the experiment was regarded on the whole as satisfactory. That means of heating carriages was spoken of as entirely new. Heating carriages by steam from the locomotive exhaust may be something new in Europe, but it is quite ancient in America. There are few important roads in America that have not been urged to adopt car heating appliances where steam from the locomotive exhaust is utilized, and in numerous instances the experiment has been tried, but in no case has it proved successful. Locomotives running through trains need all the exhaust steam to create draft, and it takes more steam to heat the cars of a train than the ordinary inventor calculates upon.

The cars on the elevated railroads of New York were heated with live steam from the locomotives, but this quantity of steam is only spared through the trains making so many stops. On the Third Avenue the trains make an average of four stops a mile, and in cold weather the engines have the greatest trouble in supplying the steam for heating the trains.

Continuous Brakes in Italy.

The Italian Ministry for Public Works, which controls the operating of the railway system in Italy, has ordered the introduction of continuous brakes on the principal lines in the country. This action is taken with the view of accelerating the speed of trains, and at the same time providing for increased safety at the higher speeds. Two brakes are ordered for experiment—the Westinghouse automatic and the Hardy non-automatic. These brakes will be run in competition.

Proposing Wider Rails.

A correspondent writes us saying that ever since his first job, in a railroad shop, of running the big lathe, he has been impressed with the idea that, could the face of the rail be made wide enough to bear the whole width of the tire, it would save great trouble and expense in the turning of tires. He sent a sketch of a broad rail which he proposed to replace the present form of T rail. While it is quite natural for a machinist working at the wheel lathe to conclude that a great part of his work might be saved, a deeper insight into the matter would show that no change could be made on the rail section without entailing greater expense than turning tires amounts to.

Encouraging Co-operation.

Mr. Andrew Carnegie, of the Edgar Thomson Steel Works, than whom no great employer of labor in this country takes more sympathetic interest in the welfare of his workmen, has been encouraging the employes of the works to aid their condition by means of co-operation. At first a proposal was made for the company to run a store where the men would receive their goods at wholesale rates, but as this savored of the truck system, reflection on the matter led Mr. Carnegie to propose what we think is a better plan. This is, that the workmen organize a co-operative store and manage it themselves; and as an encouragement to the enterprise the company agrees to furnish the building. Co-operative stores are extensively in operation among British workmen, and no kind of commercial enterprise has been better conducted. The experience which workmen receive from their connection with co-operative stores has a most elevating effect upon their business habits. Just as the truck system, by reducing his direct control of expenditures, demoralizes the ordinary man, making him improvident and callous about his household management, co-operation, by increasing a man's responsibility, has the opposite effect. When a man is expected to take an active share in the management of a store, to let his voice be heard in the kind of goods that ought to be purchased and in the extent of credit to be allowed to other members, his business views are widened. By obtaining even in a small way the responsibility of a capitalist its good influence will be exerted on the conduct of his private business matters.

At a recent meeting of the Engineers' Club of Philadelphia President Ludlow described tests of the crushing strength of ice which were made by him in order to learn, approximately, the strength required for an ice harbor of iron screw-piles, in mid-channel, at the head of Delaware Bay. Eighteen pieces were tried with government testing machines at Frankford, Philadelphia, and at Fort Tompkins, Staten Island. The specimens were carefully prepared, 6 inch and 12 inch cubes, and roughly cut slabs about 3 inches thick, of different qualities and from different localities. For pure Kennebec ice the lowest strength obtained was 327 pounds, and the highest 1,000 pounds, per square inch. For inferior qualities the strengths varied from 235 to 917 pounds. The higher results were obtained, generally, when the air temperature in the testing room was from 29° to 36° F.; as against 55° to 68° F. for the lower results. The pieces generally compressed ½ to 1 inch before crushing.

We find nineteen towns named "Princeton" in the United States. If the writer of a communication just received by us, and postmarked "Princeton," no State being named, and postmark being illegible, will tell us in what State P. O. Box 241 is located, we shall doubtless be able to fill his order satisfactorily.

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NEW YORK, MARCH 29, 1884.

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Some Industrial Exhibitions this Year.

The most important industrial exhibition to open this year is the World's Industrial and Cotton Centennial Exposition at New Orleans, which is to run from the first Monday in December, 1884, to the 31st of May, 1885. It is to be an immense affair, held under the joint auspices of the United States Government, the National Cotton Planters' Association, and the city of New Orleans. The regulations recently published are similar to those of the Centennial at Philadelphia. All foreign objects for the Exhibition are to be admitted free of duty, except those intended for sale or consumption. The selection of the chief city of the South for this World's Fair promises to be a happy one. Southern industrial developments have been more rapid recently than those of any other section of the country. The exhibition of 1881, at Atlanta, was a decided success, and this one, which is projected upon a much larger scale, should be productive of excellent results.

The twelfth Cincinnati Industrial Exhibition opens Sept. 3d, and closes Oct. 4th. No charge is made for space or steam power, and the price of admission this year will be twenty-five cents.

The fifteenth exhibition of the Massachusetts Charitable Mechanic Association will open in Boston some time next September, and continue about ten weeks. The last previous exhibition was held in 1881.

The St. Louis Exposition opens Sept. 3rd, and closes Oct. 18th, 1884. A permanent building 506 feet long and 322 feet wide is now being erected which will cost about $600,000. It will have 280,000 square feet of space.

One drawback to the completeness of exhibitions held during the last four or five years has been the extra activity of manufacturers. Many of them could not spare goods for display during the time an exhibition was to run. This year, as manufactures are not so active as they have been, goods can be spared more conveniently, and orders from new customers are considerably sought after.

The daily papers have lately been publishing news items about the formation of a brass monopoly and a tack monopoly. There is really no danger of a monopoly in either. Combinations among manufacturers of brass and tacks are quite possible, but, when they combine and assume the role of monopolists, speedy dissolution is inevitable. Manufacturers of brass and tacks possess no special privileges conferred upon them by the Government—not even patents to control the business. Any party having the necessary capital can enter the business, and, when combinations are found to take undue advantage of buyers, active opposition may confidently be expected.

Co-Operation at Fall River.

We pointed out many months ago in these columns that the only satisfactory remedy the cotton mill operatives of Fall River have to avoid the perennial labor troubles in that city is to co-operate, build and manage cotton mills of their own. We are glad to note that the plan has been adopted, and that a large part of the shares needed to start a co-operative mill have been subscribed. Somerset and Dighton have both offered free sites for the mill. Heretofore the mill operatives of Fall River have furnished both labor and capital for manufacturing, but have had no control of the business. The managers of the mills are many of them trustees of the Savings Banks, where the operatives deposit their earnings, and thus employ both the capital and labor of the latter. The operatives own considerable stock in the mills, but not enough to influence the management of a single one of them. No doubt the new co-operative movement will receive the encouragement of the public.

Stealing a Locomotive.

Some young men, whose ambition has become diseased through demoralizing stimulants of blood-and-thunder, yellow-cover literature, seem to think that stealing a horse is a proper feat to start out with on their road to fame and fortune. Where they have stolen railroad rides out to the borders of civilization, before entering upon their horse-stealing enterprise, their career is generally stopped suddenly short at the end of a hemp rope. These would-be tinsel heroes are generally overgrown boys who have made too little acquaintance with the rod of correction. One of this class, named Davis, recently changed the programme a little at Hendersonville, N. C. He wanted to run away to Texas, and, whether it was that he had no confidence in his ability of holding on to the top of a horse or that the weather was too cold for that method of traveling, cannot now be learned, but certain it is that Davis started out by stealing a locomotive. A locomotive is not a good article to steal, for it cannot be hid in a thicket, and the worst kind of failure follows any attempt to run it out into the grassy prairie. Davis soon found himself beset with snares on his stolen locomotive, and a few miles riding convinced him that his safest plan was to betake himself to the woods, and leave the locomotive to be caught by those who were in hot pursuit. The denouement of the affair is not encouraging to other youths hankering after fame of this kind, for, after being hunted from place to place for several weeks, this misguided youth shot himself to avoid arrest.

A committee of the House of Representatives has unanimously reported a bill providing that $1,000,000 a year shall be appropriated by the Government for ten years to be applied for maintaining the New York State canals, so long as they shall be free to the commerce of the United States. The bill ought to pass unanimously. It costs a great deal to keep the New York canals in good navigable condition, and, as they are as free for use as the Hudson River, the General Government should appropriate money for their maintenance as readily as when it is needed to improve river navigation.

We publish on another page the second paper on draft-regulating appliances of locomotives, by J. Dugald Campbell. Mr. Campbell is the general foreman of machinery of the New York Elevated Railroad, and he has had extensive experience in the mechanical departments of surface railroads before going into his present position. In some respects his views on draft-regulating appliances are original. The subject has received too little attention from practical men, and we believe these articles impart much needed information.

In commenting, some weeks ago, on the rumored reconstruction in the Rogers Locomotive Works, we made some depreciating remarks about the want of proper system in these works. This has been construed by some parties into the belief that we implied that they turned out inferior work. We had no intention of implying or asserting anything against their product, but merely against their methods of producing it.

In a recent issue, we advertised to the effect that we desired to buy back, clean copies of our issues bearing date January 1 and 8, 1881, and January 7 and 21, 1882. We desire now to state that we have received all the copies of the above issues that we can use at present

Literary Notes.

TABLES FOR CALCULATING THE CUBIC CONtents of Excavations and Embankments, by an improved system of diagonals and side triangles. By John R. Hudson, C.E.: John Wiley & Sons, New York.

This book is intended for civil engineers, engaged on the measurement of earth-works, and has its data very well arranged. The formula given has the advantage of being much shorter than found in the ordinary hand-books, a feature which will recommend it to busy men, like engineers on construction work.

RAILWAY TURNOUTS. BY JACOB M. CLARK: D. Van Nostrand, 23 Murray street, New York.

The matter from which this book is formed constituted one of the papers submitted to the American Society of Civil Engineers in 1869, but was considered too technical to be published in the Society's "Transactions." Its purpose is to give directions to engineers and trackmen how to lay out railway sidings and crossings. The author is a safe authority to follow, by those competent to do so. We think he rather overestimates the technical attainments of trackmen, when he directs them to measure the middle ordinate in feet on a 200-feet chord, etc. The book will be a valuable addition to railway engineering literature, if it does not prove too technical for the men it is intended to direct.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(125) W. W., Hartford, Conn., asks: Does the increase twist of a drill take out the chips better than the regular twist? *A.*—The assumption is that it does. We have never tested the matter.

(126) A. C. H., Noroton, Conn., asks: How can I secure the greatest resistance to *starting*, in a steel bolt ¼" diameter. Shall I use 18, 20, or 24 threads to the inch? *A.*—The finer pitch will be a little less likely to jar loose.

(127) A. H., Rockhill, Ind., writes: I am running an engine the cylinder of which is cracked the entire length. Can it be mended so that it will not leak steam? *A.*—We think you cannot satisfactorily mend it.

(128) W. H., Waterbury, Conn., asks: What should be the diameter and weight of fly-wheel for an engine 2⅝"x6", at 250 revolutions, steam pressure 60 lbs? *A.*—Weight 60 lbs., diameter 24", should be satisfactory.

(129) C. R., Denver, Col., asks: Will the cupola described in your issue of January 19 melt scraps of steel castings, and will it turn the steel to cast iron? *A.*—It will undoubtedly melt steel scrap, but will not change the steel to cast iron, nor can it probably be used successfully for steel.

(130) W. P. S., Annapolis, Md., asks: What should be the proportionate size of boiler to cylinder of a small locomotive working with 10 lbs. steam? *A.*—Small locomotive is indefinite. Probably you will be able to get along with five or six feet heating surface for each horse-power developed.

(131) O. A., Groton, N. Y., writes: I have a block of cast iron 3 feet diameter and 3 feet long. How can I break it up for the cupola? *A.*—You can cut it with a tool in the lathe, and wedge off pieces, or you can do the same on the planer, or drill holes and wedge off pieces. It can be melted in a large cupola.

(132) H. M., Sing Sing, N. Y., asks: 1. What should be the diameter and weight of fly-wheel for an engine 2"x3"? *A.*—Assuming you run the engine at about 300 revolutions, a fly-wheel 15" diameter, the rim of which weighs from 25 to 30 lbs., will do. 2. What should be the length of connecting-rod? *A.*—8½ inches will be a good length.

(133) Engineer, Boston, Mass., asks: Is it safe to run a five-foot pulley with rim 2" thick and 10" wide at a speed of 125 feet of surface per second? *A.*—If the pulley is well designed and balanced, and of good material, it may be safely run at that speed. See article by Charles T. Porter, on "The Bursting Strain in Revolving Wheels," in AMERICAN MACHINIST of February 16 and 23, 1884.

(134) Subscriber, Philadelphia, Pa., asks: 1. How can I determine a safe working pressure for a boiler? *A.*—The ultimate strength of the shell, allowing it not to be weakened by riveting, is found by multiplying twice the thickness of plate by its tensile strength, and dividing the product by the diameter of the shell. Thus, in a boiler 48" diameter, made from ¼" iron of a tensile strength of 50,000 lbs., the ultimate strength is $\frac{\frac{1}{4}\times 50{,}000}{48} = 520$ lbs. pressure per square inch. To find a safe working pressure, divide this by 8; 520÷8=65 lbs. 2. What is the rule for calculating the size of safety valve? *A.*—There is no established rule. For boiler with ordinary draft, give 1" area of valve to each 1¾-foot of grate surface.

(135) J. H., New York, asks: What is the highest speed at which a steam engine has been successfully indicated, and what was the length and height of card and scale of spring? *A.*—We have no means of knowing this. You can indicate at almost any speed by shortening the card and using a high tension spring. You can best determine what spring to use, also length of card, for high speed, by experiment.

(136) Subscriber, Lancaster, Pa., asks: 1. Will you give me a receipt for making liquid glue? *A.*—Put broken glue of the best quality in a glass jar, and pour in enough acetic acid to cover it. Set the jar in a kettle of hot water till the glue is melted. 2. What is a good walnut stain? *A.*—To 1 quart of water add 1½ ounces washing soda; 2½ ounces vandyke brown, and ¼ ounce bichromate of potassa. Boil for ten minutes and apply with a brush.

(137) C. S. E., Jacksonville, Fla., asks: Will you inform me if water containing a strong solution of sulphur is injurious to a boiler; and, if so, in what manner? *A.*—Sulphur is not found in solution in water, except in combination with another element. Its most common condition in water is as sulphate of lime, when it injures the boiler by scaling. In some places, especially in mining regions, sulphur contaminates water in the form of sulphate of iron, when it has a corrosive action on boilers.

(138) E. W. H., Chicago, Ill., writes: Will you tell me what is meant by the duty of a pumping engine? For instance, a manufacturer says his engine is good for a duty of 50,000,000. Does he mean his engine will lift 50,000,000 foot-pounds for every 100 lbs. of coal burned? If so, what is the time required? *A.*—The duty of a pumping engine is expressed, in this country, by the number of pounds lifted one foot high with 100 lbs. of coal. As it costs the same effort to do this in one minute that it would in one hour, the time required is not considered. The time in which a certain amount of work can be done would be referred to the capacity of the engine. Of two pumping engines, one of which has a capacity for pumping one and the other five million gallons of water in twenty-four hours each may do a 50,000,000 duty.

(139) J. H. B., Louisville, Ky., writes: 1. Is it practicable, when casting a heavy casting, like the sketch I send, to prevent scabbing by the use of nails, the nails being set so as to leave the heads exposed? *A.*—The sketch shows a cylinder head with a considerable depression of the part that enters the cylinder, but cast without cores, and with the heads of about fifty nails exposed on the part usually polished. It is not worth while considering whether the nails will prevent scabbing, because the casting should be clean without them. No one would be likely to accept a casting made in the way mentioned. 2. I find in a book the 3.6 power of 6 given as 632.91. How shall I work this out? *A.*—3.6 is $\frac{36}{10}=\frac{18}{5}$, hence to find the 3.6 power of 6, raise 6 to the 18 power and extract the 5 root of the sum. 3. In cast-iron plates 4 feet square, made here, I have noticed that none of them are true, some of them being warped as much as six inches. What causes it? *A.*—It may be caused by improper moulding, injudicious gating, a poor quality of iron for such work, &c., &c. No one can tell at this distance what causes it.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Gears—G. B. Grant, 3 Alden st., Boston; water motors

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Metal & Wood Patterns—G. D. Lambert, N. Haven, Ct.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

Spanish translations of catalogues, circulars, &c. J. M. Da Rosa, 260 East 3d St., Cincinnati, O.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 626 E st., Washington, D. C.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

New Books, relating to steam, the steam engine, mechanics, machinery, and engineering. Send for catalogue. Fred. Keppy, publisher, Bridgeport, Conn.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

H. O. Reinhardt, M. E., Mem. Am. Soc. Mining Eng., Chihuahua, Mex., invites correspondence of man'f'rs of machinery desiring to introduce same in Mexico.

DRAWINGS FOR SALE, of the improved Corliss engine, with all the latest improvements, all sizes and styles. Address Fred. A. Phelps, Engineering Office, Room No. 5, 445 Broad street, Newark, N. J.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

BOUND VOLUMES of the AMERICAN MACHINIST for 1880, 1881, 1882, and 1883, for sale at $3 50 per volume, express charges to be paid by purchaser. AMERICAN MACHINIST Pub. Co., 96 Fulton Street, New York.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Any of our readers who have complete files of Volumes I. and II. in good condition, bound or unbound, can probably find a purchaser by addressing us, and stating the lowest price they will accept. AMERICAN MACHINIST PUBLISHING COMPANY, 96 Fulton street, New York.

Useful Information for Steam Users—A 100-page pamphlet, compiled from the best authorities, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Engineers everywhere should have this work. Send 25 cents in P. O. stamps for a copy. The J. N. Mills Publishing Co., 145 Broadway, N. Y.

Patent "Common Sense" Binder for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address, in the United States, by mail for one dollar. To Canada and foreign countries 75c., the purchaser to pay custom-house duties and express charges. American Machinist Publishing Co., 96 Fulton street, New York.

MANUFACTURES.

George Reid, Warren, O., will build a foundry and machine shop.

The new machine shop at Franklin, N. H., is ready to commence operations.

A. C. Stickney & Co., Oxana, Ala., will build a foundry and machine shop.

Polley & Son are building a $100,000 saw and planing mill at Bainbridge, Ga.

The Muskegon (Mich.) Car Works will be enlarged by an addition of 80x130 feet.

It is stated that there are over 2,000 Otto gas engines at work in the city of London alone.

It is probable that a new rolling mill will be erected this spring at or near Middletown, Pa.

The Carver Iron Foundry Company has decided to locate in South Abington, Mass., near the depot.

Jere. Baxter, of Nashville, is trying to organize a company to build two blast furnaces at Sheffield, Ala.

At Dover, Me., Mayo & Son contemplate tearing away their old foundry and erecting another on its site.

The citizens of Wichita Falls, Texas, are trying to induce capitalists to erect a woolen mill in that town.

Tanner & Faxon, paper manufacturers, Lee, Mass., are putting in a 90-horse power tubular boiler.

J. & G. Adams have purchased the McDonald & Co. machine shops, at Millersburg, O., for $4,000, at sheriff's sale.

The new cotton mill of the Eagle and Phœnix Manufacturing Company, at Columbus, Ga., will cost $1,000,000.

Stock to the amount of $250,000, of the required $300,000, has been subscribed to build the cotton mill at Roanoke, Va.

The Phelps Manufacturing Company, San Francisco, Cal., will soon build a large rolling mill, and enlarge their workshop.

The Eleventh Ward Bank, New York City, has a building permit to erect a four-story brick factory, 50x36 feet, to cost $10,000.

The Waukau (Wis.) Woolen Company have erected a new mill, 42x72 feet, three stories high. It will be in operation by April 1st.

The Union Twist Drill Company, of Boston, have started their works in the manufacture of the Farmer Universal Fluted Drill.

A company has been formed to build nail works at Lewisburgh, Pa. The citizens donate a site and several thousand dollars to the company.

The Texas and Pacific Railroad Company are enlarging their machine shops at Big Springs, Texas, and will build a large round-house at Dallas.

Ground has been purchased at Durham, N. C., as a site for the new cotton and woolen mills. Odell & Co., of Greensboro, will build the mills.

The machine shop at Calera, Ala., now building for E. R. Jones, will be capable of turning out the largest engines as well as smaller machinery.

Lockwoods, Green & Co. are to erect the mill of the Darlington (S. C.) Cotton Mill Company, 207 feet long and four stories high. It will have 10,000 spindles.

David Jenkins, Sheboygan, Wis., will build an iron foundry, 40x100 feet, and put in a 5-ton Yale & Towne traveling crane, and one McKenzie cupola and blower.

The business men of Port Huron, Mich., are trying to organize a company with a capital of $50,000 to induce Rood & Co., of Detroit, to locate their brass foundry there.

Ellis & Lessig, Pottstown, Pa., write us that they will not build an iron foundry. They intend building a nail factory and rolling mill, but have not yet determined on size.

The Phillips & Buttroff Manufacturing Company, of Nashville, Tenn., will enlarge their foundry, at that place, and build a foundry at Elyton, Ala., to use fifty tons of pig a day.

We understand that the Cincinnati, New Orleans, and Texas Pacific Railroad (generally known as the Cincinnati Southern), will build new and extensive shops at Chattanooga this year.

Vance & Bliss have lately gone south and opened a machine shop, for doing general repair work, at Salem, N. C. For the present they will do repair work only. They are meeting with good encouragement.

S. W. Goodyear, Waterbury, Conn., has inquiries from all parts of the United States, and some from foreign countries, about his wire-pointing machines. He has sold seven machines since January 1st.

The Putnam (Conn.) Foundry has failed to get enough of the stock taken to form a corporation, and the plant is to be thrown into the market. F. S. Lee, late superintendent, will go to New York to engage in business.

J. S. Robinson, of the new firm of Halliday, Griffith & Co., has purchased the ground and plant of the Oneida Knitting Company, and will begin operations shortly. Mr. Robinson also contemplates the erection of a four-story mill at Utica, N. Y.

Citizens of Farmington, Me., have raised nearly a thousand dollars by subscription to purchase land for the erection of a large lumber mill. Negotiations are pending with a manufacturing firm, and the mill will probably be built the coming season.

The Durham (N. C.) Woolen Company have just organized with a capital of $150,000. Thirty acres of land has been purchased for a site on which to erect buildings and begin the manufacture of woolen goods, as soon as the work can be judiciously executed.

The Howe Sewing Machine Company's works, at Bridgeport, Conn., which were burned last July, have been rebuilt, and they have begun to ship goods. They now employ 143 men, and will increase to 350 by April, in which month they expect to make 2,000 machines.

G. W. C. Lomb, president of Birmingham (Ala.) Cotton Factory, says capital will be increased to $250,000, and a new mill built. Mr. Lomb is also interested with a New Yorker who contemplates putting up another mill of about 30,000 spindles.—*Baltimore Manufacturers' Record.*

Schleicher, Schumm & Co., of Philadelphia, are turning out Otto gas engines very steadily, averaging thirty of all sizes per month. One manufacturing concern in Milwaukee recently ordered their fourth 10-horse power Otto gas engine, and all four are now working side by side in their establishment.

The Peninsular Car Works, of Adrian, Mich., are to be removed to Detroit and consolidated with the car works of that city. The new company, just organized, is composed in part of James F. Joy, General R. A. Alger, Allan Sheldon, and others, and the capital stock is $300,000. Freight cars will be manufactured.—*Industrial World.*

The Pond Engineering Company, St. Louis, have opened the water-works building season of 1884, by closing contract with the city of Greenville, Ill., for a set of pumping machinery for their water works, consisting of two three-quarter-million Blake pumping engines, with boilers, &c., complete. Work will be commenced at once.

The Siemens Regenerative Gas-Lamp Company is the name of a new corporation, which is fitting up at 819 Filbert street, Philadelphia, for the manufacture and sale of improved gas-burners, for the lighting of halls, shops, offices, &c. Besides furnishing greatly-increased light, at less cost, valuable ventilating qualities are claimed for the burners.

The finishing up of the McQueen Locomotive Works, at Schenectady, N. Y., proceeds very slowly. Charles Stamford, president of the company, whose energy pushed forward the work very rapidly during last fall, is lying dangerously ill, which takes one active force away from the business; and the business of locomotive building is not so remunerative at present as to call for the urging on of new works to engage in the business. There are rumors that Wagner Sleeping-Car Company intend purchasing the McQueen Locomotive Works and converting them into shops for building and repairing their cars.

The Angelica (N. Y.) Foundry and Machine Company has been organized by M. S. Blair, B. C. Wakeley, J. F. Brown, F. S. Smith, J. S. Peter, and W. F. Devening. Capital is $25,000. The company will manufacture, build, and repair machinery and tools. Ground will be broken at once for a shop, to be completed as soon as possible. A considerable force of workmen will be employed.

The Governor of Mississippi has approved a bill "To authorize the City of Vicksburg to contract with the Memphis and Vicksburg Railroad Company, or such other railroad companies as may hereafter become merged into or part of said county by consolidation or otherwise for location of machine shops of said county at said city, and for other purposes."

The Schenectady Locomotive Works have been closed down for several weeks, for the purpose of putting in a new Corliss engine, and making other improvements in machinery arrangements, with the view of facilitating work. They have now resumed operations, with a force of about four hundred men. This is a considerable reduction of the men they employed during the summer.

Keuffel & Esser, 127 Fulton street, New York, have published for distribution an illustrated circular of their "Lightning black process, for copying drawings and tracings." By this process the lines appear in black or white ground, as in the original drawing. The copies, by this process, present a waterproof surface. The circular states prices at which drawings will be copied by this process, and gives specimens of the work done.

The Boston *Commercial Bulletin* says: Some time since, the Saunders Cotton Mill, of Saundersville, Mass., had a singular accident in one of their mills, a 72x24" Medart pulley going to pieces while running, doing considerable damage, besides scaring the help. The management have recently substituted a solid cast-iron pulley for this one, besides removing its mate of the same kind, now having two solid cast-iron pulleys.

P. Blaisdell & Co., Worcester, Mass., have just issued a new illustrated catalogue of machinists' tools, built by them. The catalogue consists of twenty-two pages, and is very tastefully printed on super calendered paper. In the preface, they say: "Our machines are all constructed of the best materials and in the most perfect manner. Each machine, before leaving the shop, is thoroughly tested, and we warrant them first-class in every respect."

William B. Bement & Son, Philadelphia, report an improving condition of business during the past month. They are working 330 men, mostly on ordered machine tools, and have very little stock on hand. Among other special work, they are building a shearing machine for the American Ship-Building Company, of Philadelphia, which uses a forged steel screw, 6 inches diameter and 41 feet long. It is being finished with all the care which this establishment gives to all its work.

A. Aller, 109 Liberty street, New York, has published a pamphlet, in which is described the connecting and operating of the Korting exhaust steam induction condenser for steam engines, and in which are tables giving the horse-power of engines with cylinders from 8" to 26" diameter for each 100 feet piston speed, also the amount of condensing water required for different speeds of pistons and different points of cut-off. It makes a book that will be very likely to be preserved by engineers.

Carriage-making is becoming a prominent industry in Huntington, L. I., N. Y. William Downs will begin, about the first of April, the erection of a large carriage factory, 40x80 feet, on a lot on Wall street, near Main street, which he has recently purchased. Rogers & Grummon have just opened their large, new carriage factory on Main street. Charles Vail, formerly of Huntington, has returned to open a carriage factory, beginning with an order for fifty light wagons for his former employers, Brewster & Co., of New York.

The *National Labor Tribune* says: Papers of incorporation for a new rolling mill, at Birmingham, Ala., have been taken out, and the enterprise is being pushed. The capital stock is to be $50,000, and will be subscribed in 5,000 shares at $10 per share. Already a large amount of stock is subscribed. When all the stock is subscribed, the firm will get a donation of five or six acres of land. The new firm will pay Pittsburgh prices all through. Now here is a chance for our steady, skilled millmen to become employers. Every skilled workman will be a stockholder. If any of our men want further information on the subject, they can write to L. G. Pettijohn, Birmingham, Ala.

By the fire, at the foundry in South Brooklyn, Thursday evening, February 28th, the Lidgerwood Manufacturing Company lost only a small portion of the large amount of patterns belonging to them. The various newspapers in New York and vicinity reported the loss from $50,000 to $70,000, whereas the total loss did not exceed $6,000; the fire occurring in a room, where, fortunately very few patterns had been stored. The company lost no time in making new patterns, commencing the following day with a large force of pattern-makers, and have at this writing made such progress that they will very shortly have new patterns equal to those which were destroyed.

By the wise system adopted by this company, of always keeping on hand a number of castings of the various hoisting engines manufactured by them, no delay has been occasioned in filling orders or building engines for stock.

Machinists' Supplies and Iron.

New York, March 13, 1884.

There is very little change in the market from the report of last week.

Iron—American pig is quiet and steady, almost all purchases being confined to small lots. No. 1 X Foundry, $20.50 to $21; No. 2 X $19 to $20; Grey Forge $16.50 to $17.50.

Scotch pig—Coltness, $21.50 to arrive, and $22 to $22.50 from yard; Glengarnock, $21 to arrive, $22.50 yard; Gartsherrie, $21.50 to $22; Summerlee, $21.50 to arrive, $22 yard.

Copper—There has been no change in the market. For ingot Lake, 14⅞c. to 15c., and other brands 14c. to 14½c.

Lead—Common pig is firmer, with sales at 4.15c., and holders now asking 4.25c.

Tin—A sharp advance in the London market has had an upward tendency here; Banca, 19¾c.; Straits and Malacca, 18¾c. to 18½c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

A tool-maker, experienced in all tools required for lamp, button, and other brass goods, wishes a situation. Address W. M., Box 753, Waterbury, Ct.

Pattern-maker, of more than 20 years' experience, on all kinds of work, desires situation. Used to managing men. Address Box 3, Am. Machinist.

Situation wanted, by experienced designer and draughtsman, on engine and saw-mill work. Can estimate costs and manage men. D., Box 1, care of Am. Machinist.

A first-class pattern-maker desires liberal engagement with an engineering firm. Western States preferred. Highest references. Address Box 233, Brantford, Canada.

Wanted—A situation, by a first-class pattern-maker, who is experienced in gearing, machinery, and engine work; is a good draughtsman, and capable of overseeing men. Address "Patterns," Box 2, Am. Machinist.

Situation wanted, as foreman of a boiler shop. Have had 20 years' experience as foreman, and am conversant with marine stationary and locomotive work. Address George Marshall, care American Machinist.

An American, of thirty, wishes to take charge of tool-room (April 1) in shop where industry, ability, and honesty will be expected. Eleven years' experience; best of references, from present employers. Address "Tools," care Switzer Brothers, Monson, Mass.

Wanted—By one of the largest establishments in Germany, to take charge of the steam engine department, a superintendent having a thorough technical education and extensive practical experience in the manufacture and erection of stationary pumping and rolling-mill engines, and who is fully acquainted with the latest progress in this line. It is desirable that he should speak German fluently. Address, with statement of former occupation, references, salary expected, &c., H. B., Box 12, Am. Machinist.

The manufacturers of saw-mills and hosiery machinery. Send their address to Box 258, Waynesboro, Pa.

Wanted—A first-class concern, to handle the Beard faceplate described in this issue. For particulars, address F. C. Beard, Aurora, Ill.

Wanted—A good second-hand iron planer, to plane 62 inches wide, 10 feet long; height immaterial. Address "Planer," office of the Am. Machinist.

NOTES IN MECHANICAL ENGINEERING.

Compiled principally for Students, but also of great value to all Mechanical Engineers. By HENRY ADAMS. 93 pages, 12mo, $1. Descriptive Catalogue (100 pages) free

E. & F. N. SPON, 35 Murray St., N. Y.

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Thurlow, Penn.

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Strength and Quality Equal to Steel Forgings.

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BRANCH OFFICE, 800 N. 2nd STREET,

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FOR HARD COAL OR COKE,

BRADLEY & CO., - Syracuse, N. Y.

FOR SALE, ONE 9 FOOT BORING AND TURNING MILL, with two heads, built by Niles Works, Cincinnati, Ohio. In very good working condition. *Will be sold at a low figure.* We have contracted with the Niles Tool Works for a mill to swing 20 feet, and therefore offer the small tool for want of room. Address,

COLUMBUS MACHINE CO.,

Columbus, Ohio.

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AUTOMATIC ENGINES, BALTIMORE, MARYLAND.

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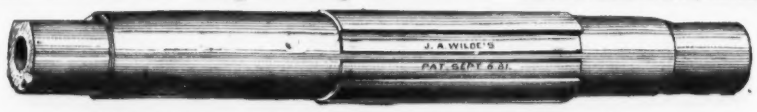

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SEND FOR A COPY.

Address, GEO. F. BLAKE MANUFACTURING COMPANY,

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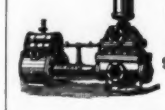

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HOLYOKE, MASS.

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FOR EVERY POSSIBLE DUTY.

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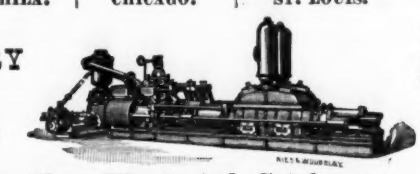

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Manufacturers of the Union Emery Wheel Emery Wheel Machinery & Tools a Specialty. Grinders' and Polishers' Supplies.

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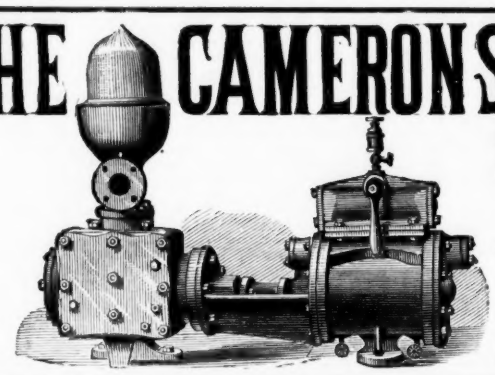

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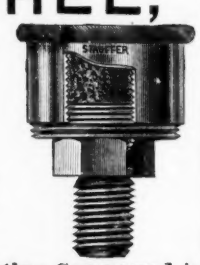

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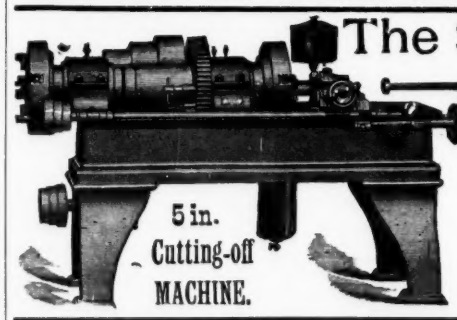

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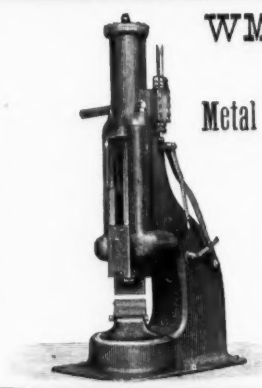

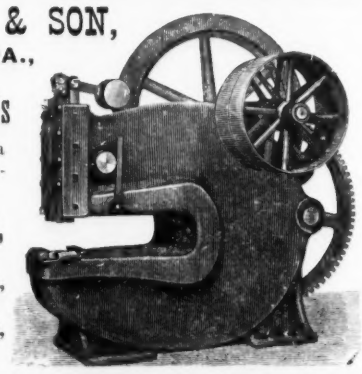

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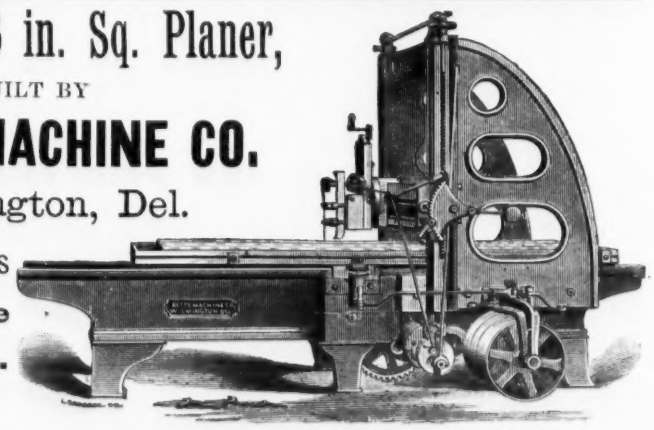

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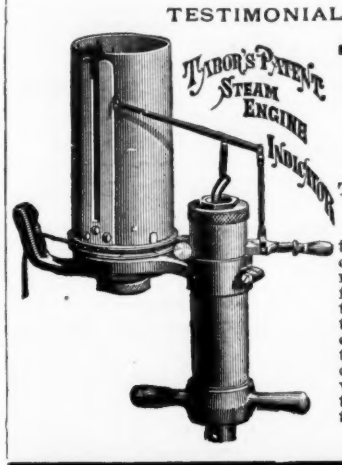

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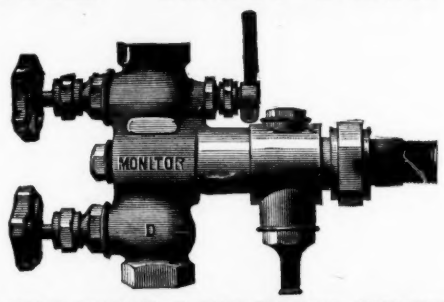

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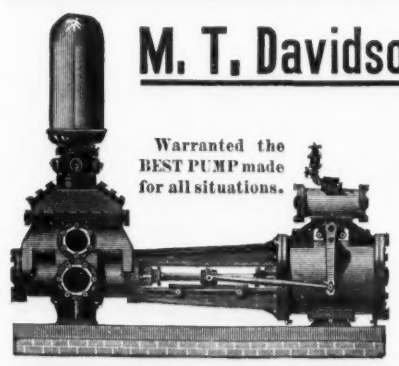
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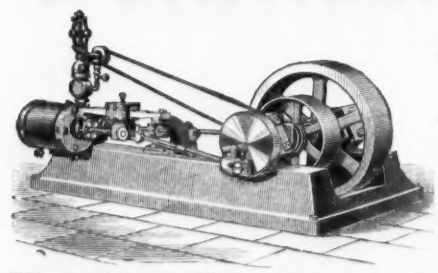
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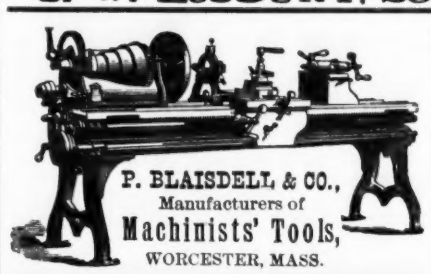
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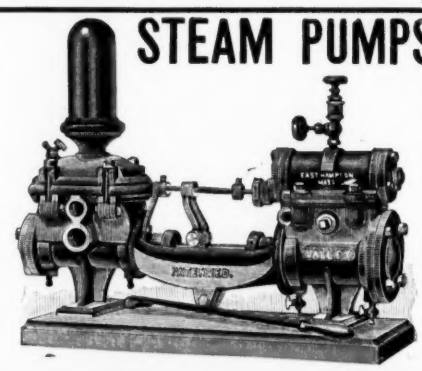
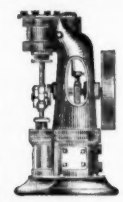
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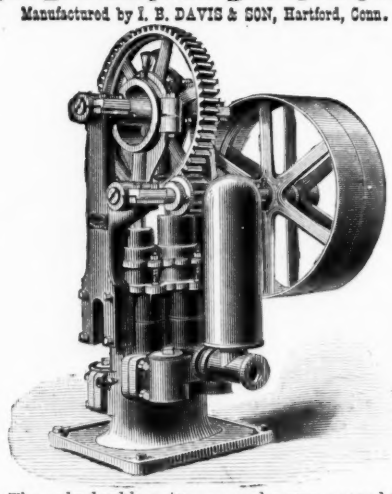
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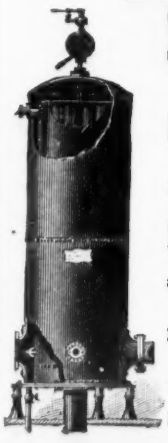
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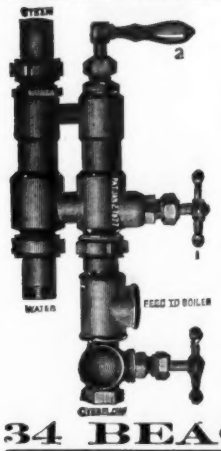

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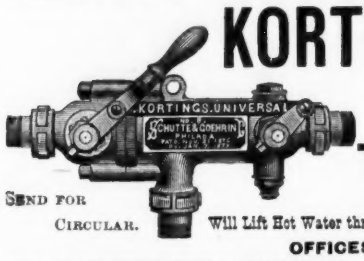

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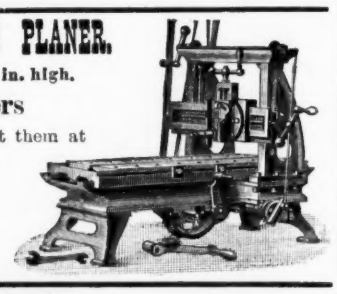

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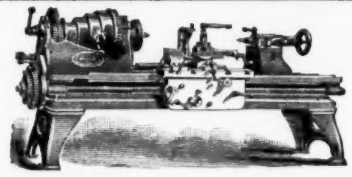

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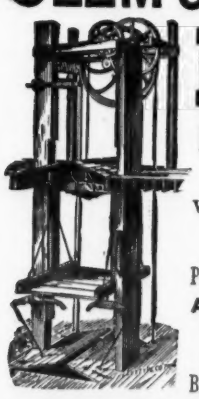

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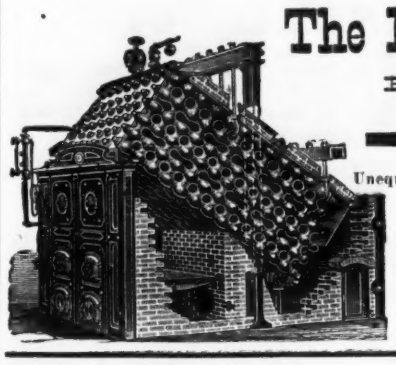

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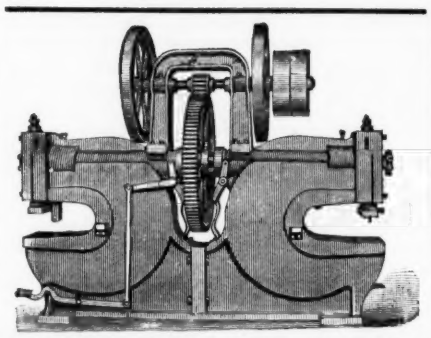

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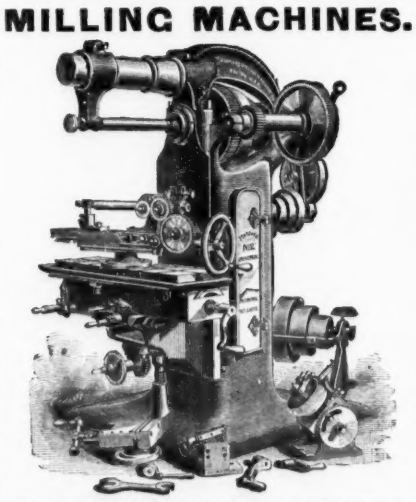

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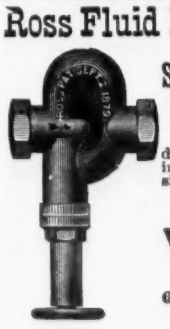

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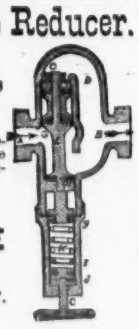

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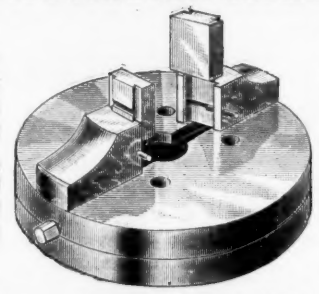

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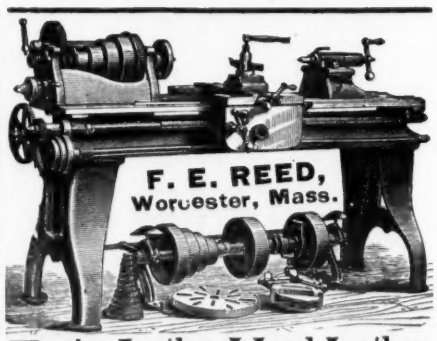

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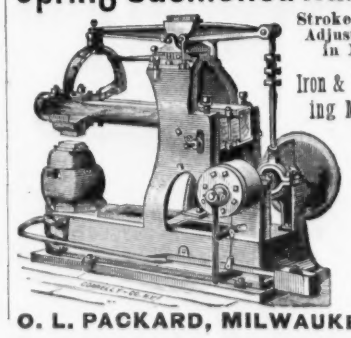

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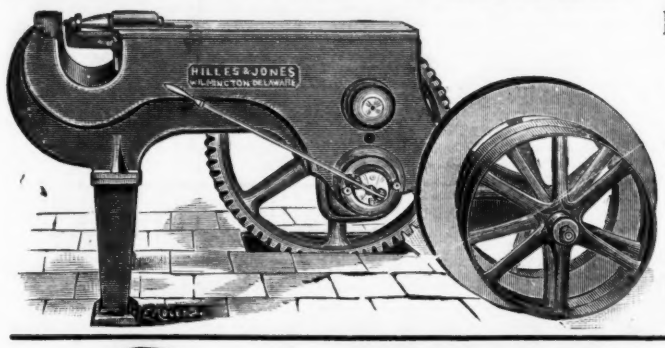

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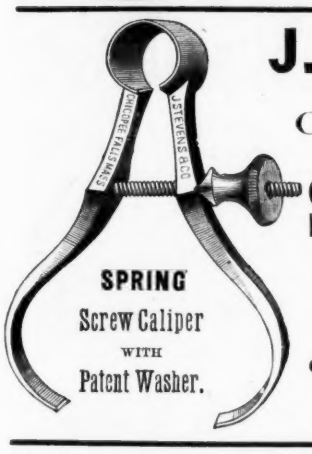

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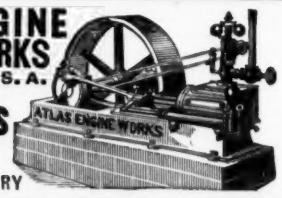

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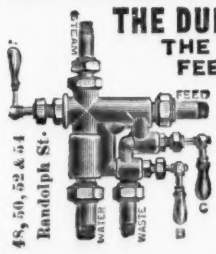

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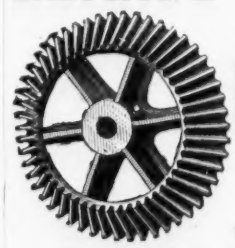

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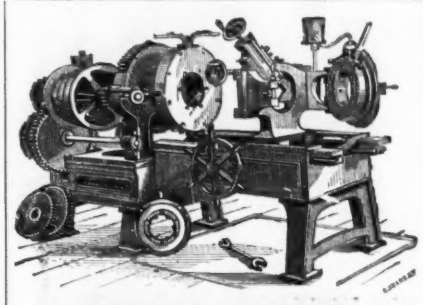

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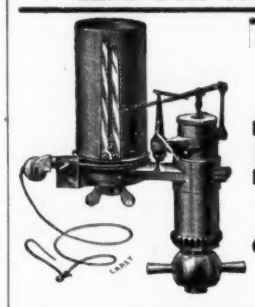

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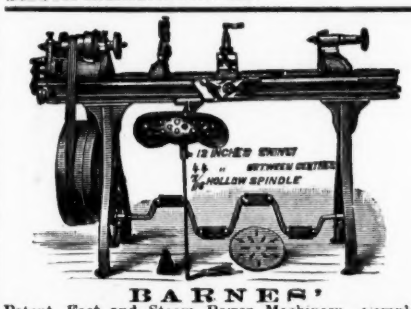

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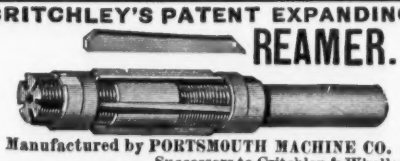

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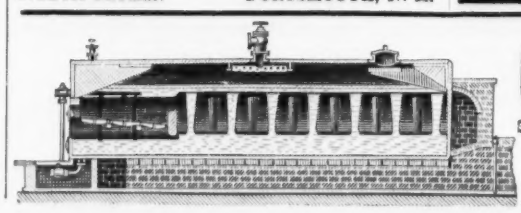

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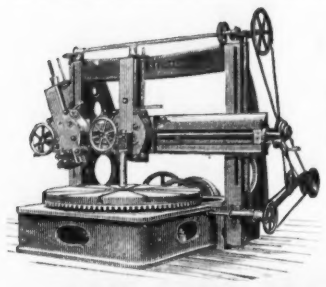

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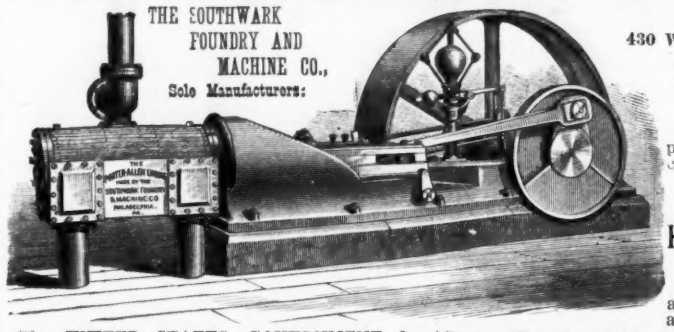

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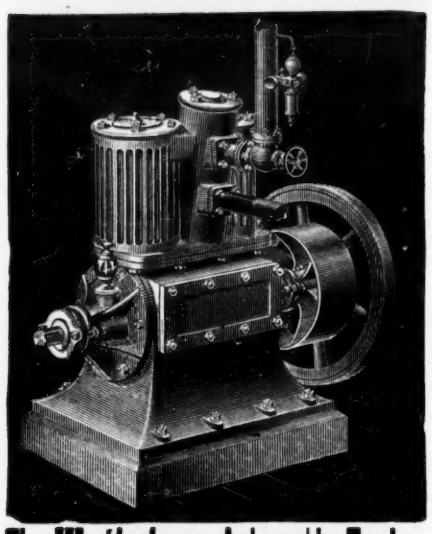

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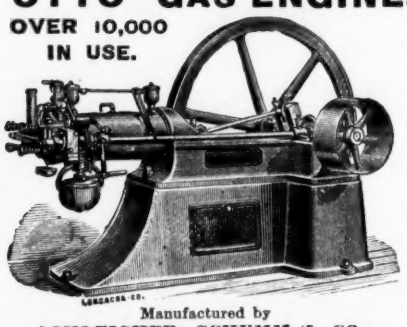

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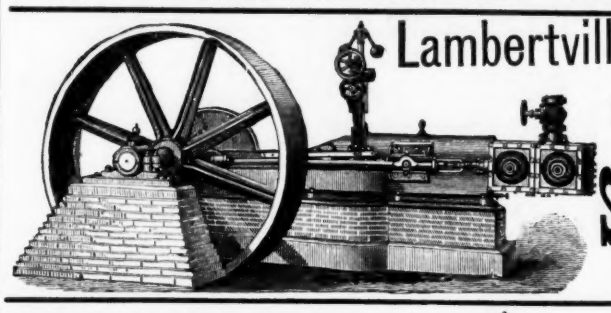

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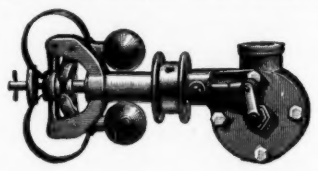

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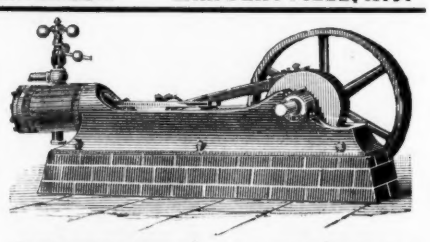

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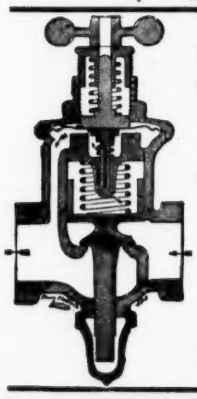

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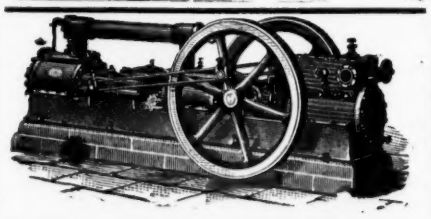

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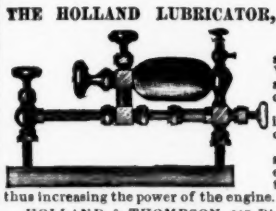

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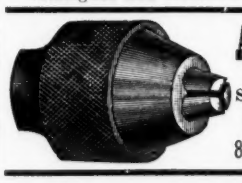

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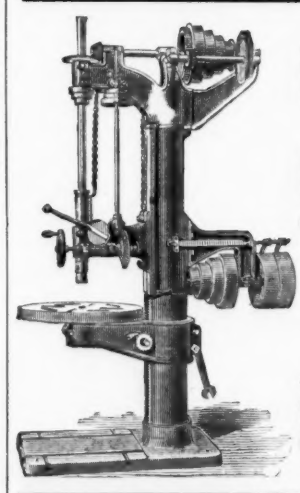

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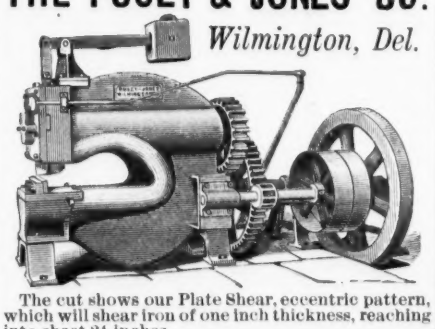

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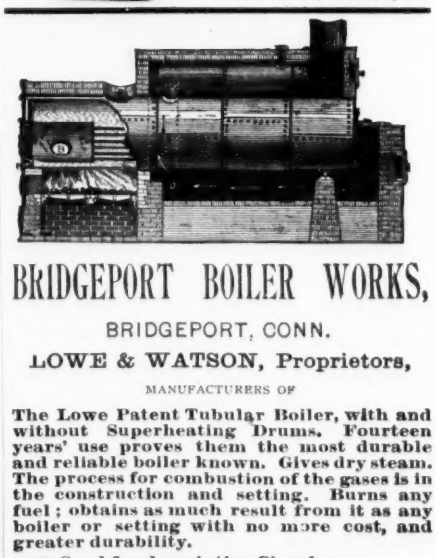

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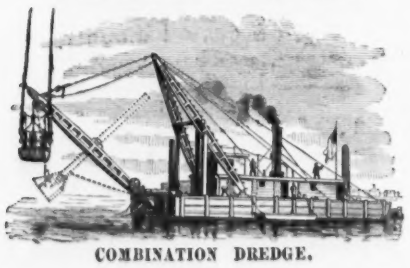

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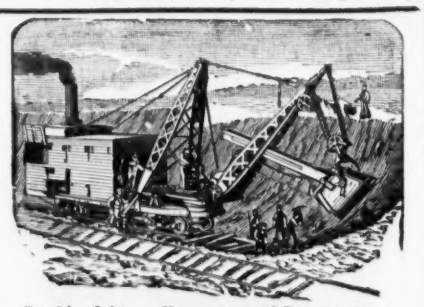

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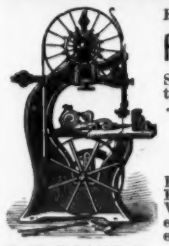

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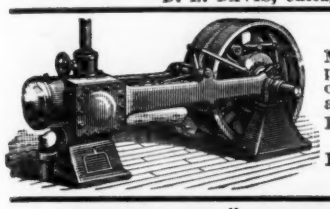

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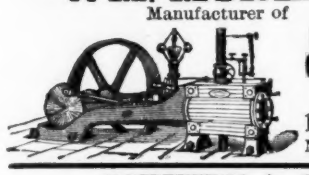

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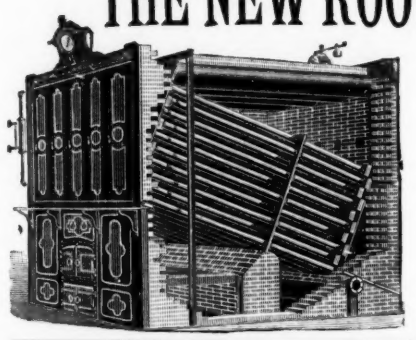

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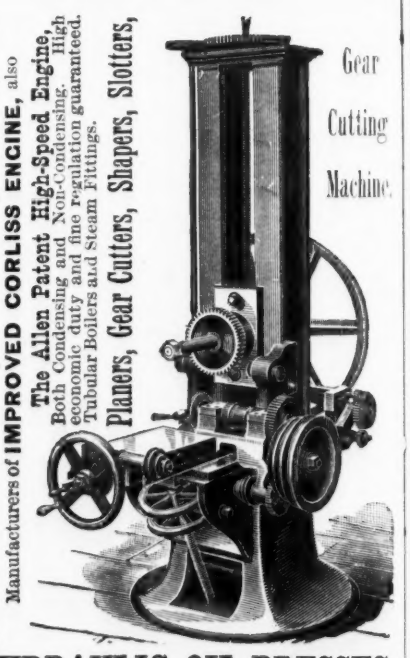

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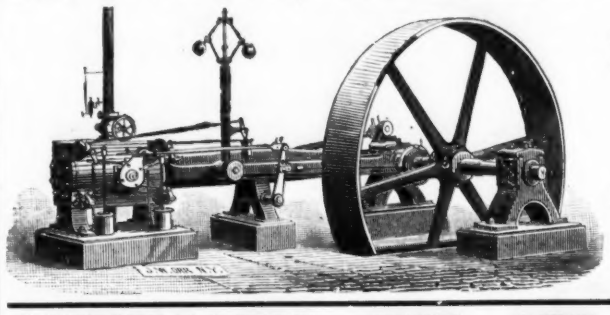

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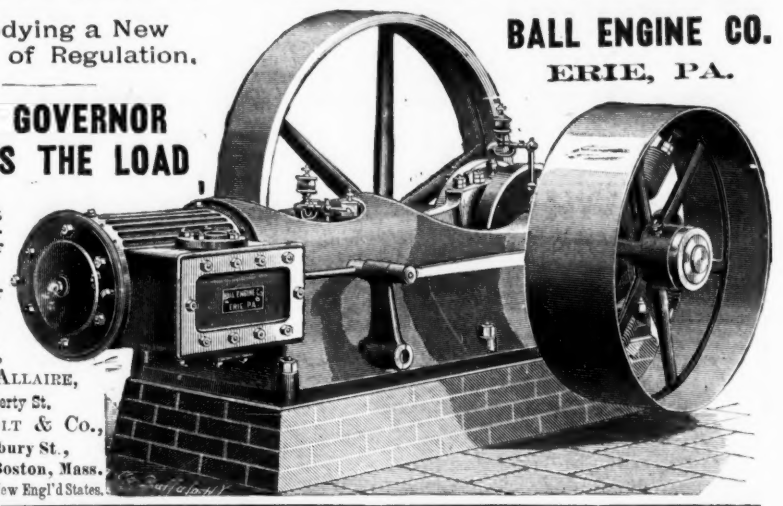

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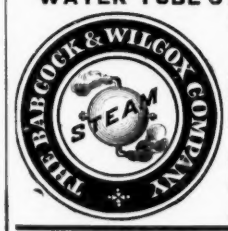

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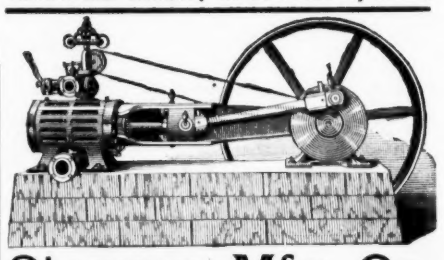

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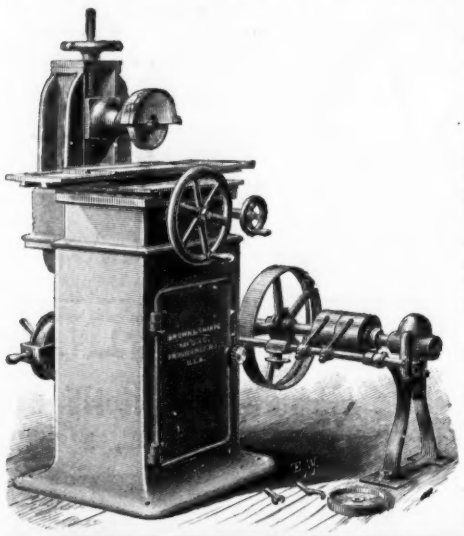

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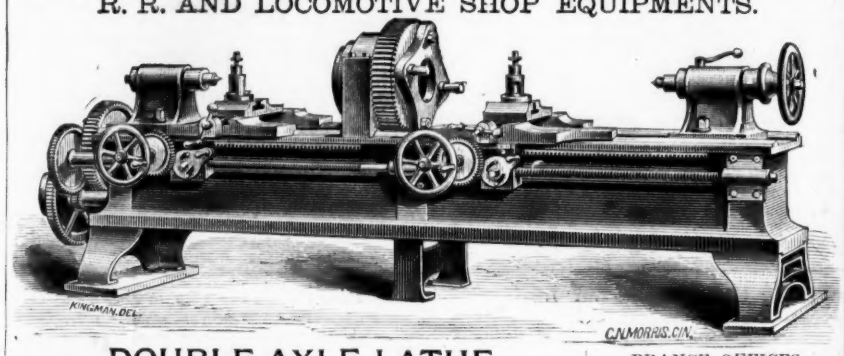

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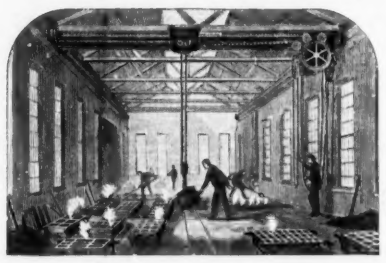

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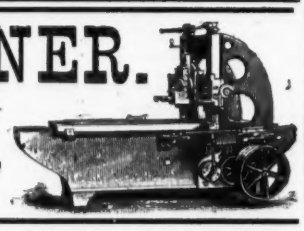

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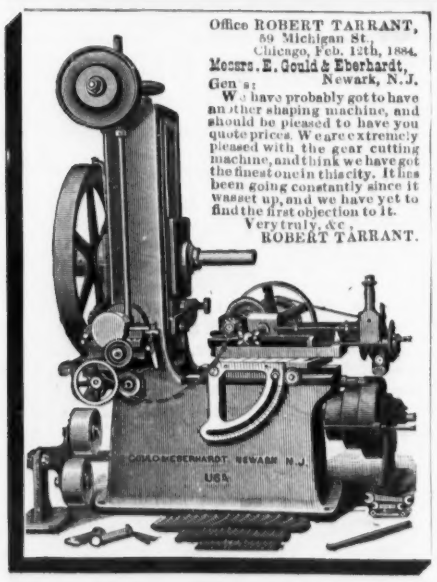

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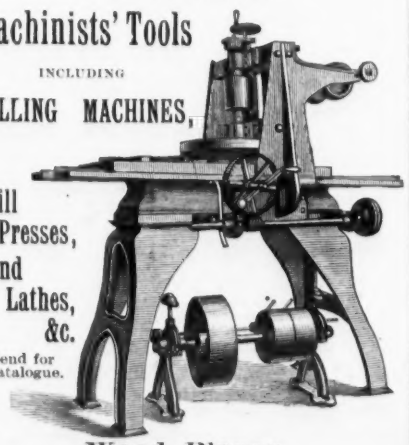

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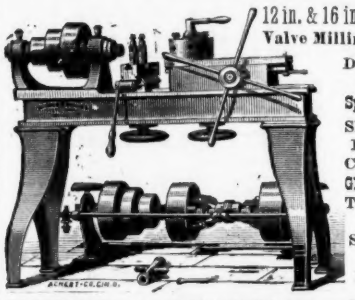

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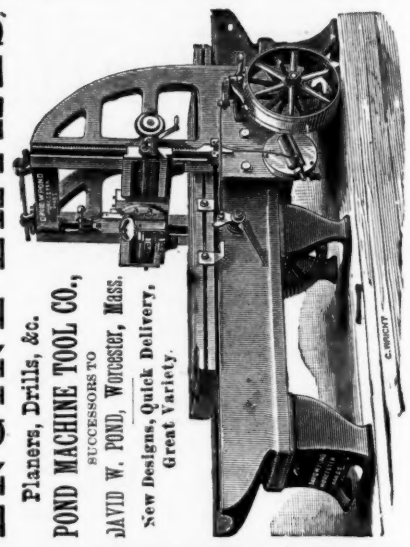

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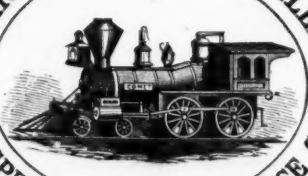

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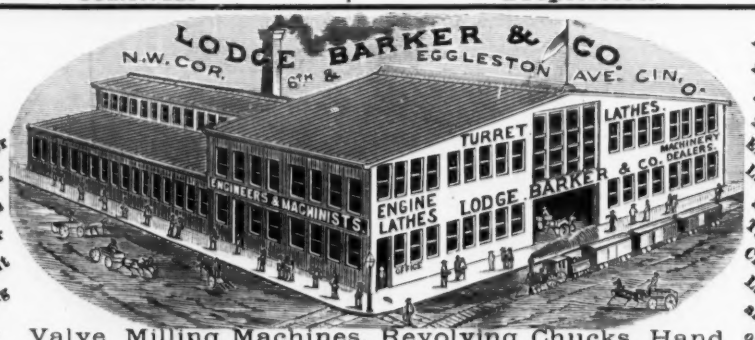

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